



Climate Smart Agricultural Technologies, Innovations and Management Practices for Green Gram Value Chain

TRAINING OF TRAINERS' MANUAL



Compiled By:

Wasike V., Karimi, R., Esilaba, A.O., Micheni, A., Mutisya, D., Karanja, D., Njiru, E., Wayua, F., Amata, R., Ndubi, J., Wambua, J., Wanjala, W. Muriithi, C.

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KALRO Secretariat

P O Box 57811-00200

Nairobi, KENYA

Email: directorgeneral@kalro.org **Tel. No(s):** +254-722206986/733333223

Compiled by: Wasike V., Karimi, R., Esilaba, A.O., Micheni, A., Mutisya, D., Karanja, D., Njiru, E., Wayua, F., Amata, R., Ndubi, J., Wambua, J., Wanjala, W. and Muriithi, C.

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Foreword

Kenya Climate-Smart Agriculture Project (KCSAP) tasked the Kenya Agricultural & Livestock Research Organization (KALRO) with the implementation of the project Component 2, on ‘Strengthening Climate-Smart Agricultural Research and Seed Systems’. The component activities are geared towards the development, validation, adoption and delivery of context specific climate smart agriculture (CSA) technologies, innovation and management practices (TIMPS). The other responsibility was development of sustainable seed production and distribution systems for priority value chains to enhance availability and access to seed, breeds and fingerlings by target beneficiaries under Components 1 (Up scaling Climate-Smart Agricultural Practices). Against this background, KALRO and her NARS partners have developed, validated and availed CSA TIMPS for dissemination and adoption. The TIMPS have further been unpacked during the development of Training of Trainers (ToT) Manuals for use in training public and private extension service providers and lead farmers.

The ToT Manuals are instructional guides to be used for teaching and learning step-by-step procedures of implementing CSA innovations for each of the 13 value chains being addressed. The training content is drawn from the CSA TIMPS that support respective value chains. The content are arranged in progressive modules supported by extensive information from research information and background data drawn from the TIMPS. Their relevance are based on the needs teased out of the value chains and the project objectives. The ToT Manuals training design takes into consideration the delivery system, the partners and their roles, the duration of training and logical flow of the sessions. Similar content requiring similar delivery systems are grouped together while the roles of the partners are tapped in the training and planning of the training sessions.

The Manual is divided into modules, which have a uniform outline that ensures every aspect of the TIMPs are fully covered in way that the trainees can absorb and relate to. Various delivery methods are deployed and where possible demonstrations and practical work are incorporated to enable the trainees learn by participating in the actual field activities. Furthermore, to ensure that the training across various groups is standardized, trainers guidelines, detailed descriptions of the trainees, program, training methods and a training evaluation have been provided in the manual. Adhering to these guidelines, therefore, enables possibility to replicate the training in several locations without loss of details regardless of whether conducted by different trainers.

It is highly advised that the ToT Manuals should be used in conjunction with the respective value chains’ TIMPs documents and facts sheets in order to provide valuable resource for both public and private extension service providers. The use of this Manual is expected to spur increased productivity and resilience by farmers, while mitigating climate change impacts in the value chains to deliver the envisaged ‘Triple Wins’.

I am greatly indebted to the value chain leaders and all those who participated in the preparation of the Manual, which is expected to herald a new way of delivering training content in a changing agricultural environment.

Eliud K Kireger, PhD, OGW

Director General, KALRO

Preface

The Kenya Climate-Smart Agriculture Project (KCSAP) is a Government of Kenya project with support from both the World Bank and the government. It is a five-year project implemented in 24 counties, mainly in the arid and semi-arid lands (ASALs), at a cost of Ksh. 25B. The project development objective (PDO) is “*to increase agricultural productivity and build resilience to climate change risks in the targeted smallholder farming and pastoral communities, and in the event of an Eligible Crisis or Emergency, to provide immediate and effective response.*” This objective is to be achieved through the implementation of five key components, which are 1) Up scaling Climate-Smart Agricultural Practices, 2) Strengthening Climate-Smart Agricultural Research and Seed Systems, 3) Supporting Agro-weather, Market, Climate, and Advisory Services, 4) Project Coordination and Management and 5) Contingency Emergency Response.

Component 1 involves facilitating the empowering of farmers and communities to adopt technologies, innovations and management practices (TIMPs) to achieve the Climate Smart Agriculture (CSA) triple-wins of; increased productivity, enhanced resilience (adaptation), and reduced Greenhouse gas (GHG) emissions (mitigation). Component 2 is charged with the responsibility of providing the TIMPs. Therefore, it supports the development, validation, and adoption of context specific CSA TIMPS to target beneficiaries under Components 1 and 3 as well as development of sustainable seed production and distribution systems.

To catalyze uptake of TIMPs, Kenya Agricultural & Livestock Research Organization (KALRO) in conjunction with partners in the National Agricultural Research Systems (NARS) and Consultative Group for International Agricultural Research (CGIAR) compiled inventories of TIMPs for each of the 13 prioritized value chains (cassava, green grams, sorghum, millet, pigeon peas, bananas, tomatoes, potatoes, apiculture, indigenous chicken (meat and eggs), dairy (cattle and camel), red meat (cattle, sheep and goats) and aquaculture and 3 cross cutting value chains (natural resource management, pastures and fodder and animal health). The TIMPs were categorized into those ready for upscaling, those that needed validation and gaps that required further research. Training of Trainers’ (ToT) manuals focusing on TIMPs that are ready upscaling for each of the value chains were subsequently developed and form the basis of training county extension staff, service providers and lead farmers. They are in turn expected to cascade this training to beneficiaries in the targeted smallholder farming, agro-pastoral and pastoral communities in the 24 project counties of Marsabit, Isiolo, Tana River, Garissa, Wajir, Mandera, West Pokot, Baringo, Laikipia, Machakos, Nyeri, Tharaka Nithi, Lamu, Taita Taveta, Kajiado, Busia, Siaya, Nyandarua, Bomet, Kericho, Kakamega, Uasin Gishu, Elgeyo Marakwet and Kisumu.

KALRO having the mandate of implementing of activities under Component 2, has been instrumental in using its information resources and those of partners and collaborators to come up with the inventories of TIMPs and corresponding ToT Manuals. The use of these information resources coupled with the accompanying training and the contribution of the other project components, will go a long way in enabling the KCSAP to meet its development objective.

The National Project Coordination Unit is grateful to all who participated in the development and production of this *Training of Trainers Manual for Climate Smart Agricultural Technologies, Innovations and Management Practices for Green Gram Value Chain*. It is my hope that counties and other users will put this resource to good use as they transform and reorient their agricultural systems to make them more productive and resilient while minimizing GHG emissions under the new realities of a changing climate.

Francis Muthami

National Project Coordinator

Kenya Climate-Smart Agriculture Project

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LIST OF ABBREVIATIONS

AESA	Agro Ecosystem Analysis
AIP	Agricultural Innovation Platform
CTT	County Coordination Teams
EMF	Environmental Management Framework
ESMF	Environmental and Social Management Framework
ESS	Environmental Social Screening
FFBS	Farmer Field Business School
FFS	Farmer Field Schools
GM	Gender Mainstreaming
GMS	Gender Mainstreaming and Social Inclusion
GAPs	Good Agronomic Practices
IDM	Integrated Disease Management
IPM	Integrated Pest Management
ISWM	Integrated Soil and Water Management
KALRO	Kenya Agricultural and Livestock organization
ITK	Indigenous Technical Knowledge
LD	Lead Farmer
OCT	County Coordination Teams
SWOT	Strengths Weakness Opportunities and Threats
TIMPs	Technology Innovations Management Practices
ToT	Training of Trainers
VMG	Vulnerable and Marginalized Groups



PART 1



This part consists of four sections which includes: the background for green grams, module training content, training design and facilitator guidelines.

SECTION 1: BACKGROUND

1.1 The role of Green gram Value Chain in Kenyan Economy

The Green gram (*vigna radiata* [L. Wilczek]), also known as mung beans value chain is a major food and income generating agro-enterprise for the rural communities, contributing KES 32 billion to the Kenyan economy. The crop is grown in an area of 302,000 ha, which produces 149,000 tons annually. This is far below the domestic demand. Over the last five years, the country has registered a 61% increase in Green gram acreage from 188,000 ha in 2012 to over 302,000 ha in 2017. This is attributed to expansion of Green gram to non-traditional growing areas due to climate change. Despite its importance in drought prone environments and high demand, its yields have remained low. For example, yields declined from 0.61 t/ha in 2015 to 0.49 t/ha in 2017. However, the increase in Green gram acreage and production by 61% and 62% respectively failed to meet the growing domestic demand. Development of climate smart technologies is the most effective and efficient strategy of reversing the declining productivity.

1.2 Role of green Gram in Food and Nutrition Security

Grain legumes have been proven to lessen ‘hidden hunger’ and are a principal part of global human diet. They constitute 33% of dietary protein requirements, which is twofold under subsistence conditions. Green gram is a low-cost excellent source of dietary protein (24–28%), folate and iron and complements the common Kenyan cereal based diets among underprivileged communities. Its starch is easier to digest than that from other legumes. The crop has high levels of iron and induces less flatulence, thus it is well tolerated by children. Despite superior nutritive value, utilization at the household level is limited due to lack of knowledge on its diversified products. Linkages between Green gram production and consumption in local food systems by developing Green gram value added products is postulated to increase consumption, thus improve nutrition and decrease the micronutrient malnutrition cases common in Kenya.

1.3 Green Gram as a Climate Smart Innovation

Green gram is a major drought tolerant legume with a short maturity period of 60-75 days. This makes it popular among smallholder farmers in marginal environments with low soil moisture. The ability to tolerate drought makes it an important crop, which offers economic opportunities for Kenyan agriculture in view of global climate change. As a heat tolerant crop, it produces grain even in dry seasons when other crops generally fail. The pulse can establish quickly and accumulate biomass. It is culturally acceptable and fits well in cropping system practiced in Kenya both as a mono as well as an intercrop.

1.4 Objectives of the Training

The purpose of the training is to enhance the capacity of farmer trainers, in order to provide knowledge and skills to farmers for increased productivity green grams through adoption of appropriate technologies and management practices. Specifically, the objectives of this training are:

- a) To enhance farmer trainer's knowledge on the availability of improve on green gram varieties, GAPs including establishment and management of green gram fields.
- b) To increase knowledge and skills on green gram health management for increased productivity and resilience to environmental stressors.
- c) To provide knowledge and skills on green gram value addition technologies for increased profitability through market linkages and distribution outlets.
- d) To enhance farmers' trainers with relevant knowledge and skill on green gram post-harvest handling techniques.
- e) To provide farmers' trainers with relevant altitude, knowledge and skill in green gram farming as a business and market assessment techniques for market led production.
- f) To impart knowledge and skills in participatory techniques for empowerment of women, youth and vulnerable marginalized groups through development of inclusive stakeholder partnership programs.

After the training, the ToTs as trainers will train lead farmers (LF) in relevant aspects of green gram value chain. The training will involve providing the LF with techniques in participatory participation, mobilization, planning, implementation, monitoring and evaluation of training sessions.

The lead farmers shall thereafter up scale the adoption of GAP through farmer groups in their villages and those in the neighborhood.

SECTION 2: TRAINING CONTENT

2.1 Orientation of the Module

The training content is organized into 13 modules with a ToTal of 95 sessions spread over a period of 98 hours. The modules are targeted and orientated to ensure adoption and upscaling of Green gram Technologies, Innovations and Management Practices (TIMPs) that will help improve productivity, resilience and mitigation of harmful Greenhouse gases. The purpose of the modules is to enhance the knowledge and capacities of trainers in understanding and applying the climate-smart Green gram practices in their daily activities.

2.2. Module Outline

Each of the 13 modules has a similar outline consisting of 8 parts. These parts are:

- 1) **Introduction to the module** – context and background to training needs, knowledge and skill gaps being addressed
- 2) **Module learning outcomes** – what trainees are expected to learn
- 3) **Module target group** – trainee categories
- 4) **Module users** – trainers
- 5) **Module duration** – The minimum number of hours of exposure to materials
- 6) **Module summary** – The sequence of sessions, training methods, materials and duration
- 7) **Trainer's guideline** – detailed sessions, training methods, materials and session guides
- 8) **Participant's handouts** – detailed training notes and reference materials for trainees.

The outline for each of the 13 modules is presented in Table

Table 1: Summary of outline for 13 modules of than green gram value chain

No.	Module name	Need addressed	Expected training outcomes	Duration
1	Climate change and climate smart agriculture	Climate change effects and mitigation measures	<ul style="list-style-type: none"> • Climate change risks, hazards, impacts and mitigation measures in the Green gram value chain production. 	4 hours 30 Minute
2	Farmer field and business school (FFBS) approach in Green gram production	Mainstreaming various Technologies, Innovations and management Practice (TIMPs) through FFBS approach	<ul style="list-style-type: none"> • Have a clear understanding of Farmer Field and Business School approach and be able to differentiate between teaching and facilitating. • Be equipped with practical skills that help them feel informed and confident about their roles and ability to facilitate a participatory learning session. • Be empowered with knowledge and analytical skills to design simple experiments to test and select the best solution to their (problem) challenges (TIMPs). • Facilitate the shift from the traditional focus to improving productivity towards farming business proposition. 	7 hours
3	Green gram production niche	Low Green gram productivity	Information on Green gram production niche and appropriate climatic conditions for optimal yield availed	6 hours
4	Green gram variety selection	<ul style="list-style-type: none"> • Lack of knowledge of suitable Green gram varieties for different agro-ecological zones • Lack of quality certified Green gram seeds • Poor growth and low yields 	Information on the available Green gram varieties and their attributes availed	4 hours 30 Minutes

5	Green gram seed system	<ul style="list-style-type: none"> Low use of Green gram certified and quality seed in Green gram production 	Information on Green gram seed system and skills on production of Green gram quality declared seed acquired	5 hours 30 Minutes
6	Green gram climate smart agronomic practices	<ul style="list-style-type: none"> Insufficient farmers' knowledge of crop management options (Good Agronomic Practices (GAPs)) 	Best Green gram management practices learnt	6 hours
7	Integrated Soil and Water Management Practices for Green gram	<ul style="list-style-type: none"> Low grain yield due to poor soils and erratic rainfall 	<ul style="list-style-type: none"> Knowledge on the importance of soil analysis in Green gram production acquired Sustainable soil management techniques learnt 	9 hours
8	Crop health	<ul style="list-style-type: none"> Low production due to pests and diseases 	<ul style="list-style-type: none"> Information on major Green gram pests and diseases which cause economic losses availed Sustainable Integrated Pests and Disease Management options learnt 	10 hours
9	Post-harvest Management	<ul style="list-style-type: none"> Post-harvest loss of grains Lack of information on available ITK's for Green gram Post-harvest management 	<ul style="list-style-type: none"> Sustainable management options for reducing post-harvest losses identified 	8 hours 30 Minutes
10	Green gram value addition	<ul style="list-style-type: none"> Limited Green gram based products 	<ul style="list-style-type: none"> Information on Green gram nutritional value and its importance in food and nutritional security acquired Information on diversified utilization of Green gram for health, food security and income generation availed 	6 hours

11	Mechanization of Green gram production activities	Inadequate knowledge and skills on appropriate mechanization technologies	<ul style="list-style-type: none"> Information on appropriate mechanization technologies availed 	7 hours
12	Green gram Business and Marketing	Low income at the household level	<ul style="list-style-type: none"> Innovative and operational Green gram marketing strategies and marketing chains identified Skills on formulation of various Green gram-based value added marketable products learnt Business plan developed 	7 hours 30 Minutes
13	Green gram Cross Cutting Issues			
I	Agricultural Innovation Platforms		<ul style="list-style-type: none"> The attributes of an innovation platform appreciated and applied Stakeholders mobilized to initiate an Agricultural Innovation Platform Agricultural Innovation Platforms established, managed and monitored The Agricultural Innovation Platforms and innovation capacity of AIP actors sustained 	3 hours

II	Gender mainstreaming and social inclusion	Gender inequity and low integration of VMGs in Green gram production	<ul style="list-style-type: none"> • Gender, youth and VMG inclusion strategies in Green gram production learnt and disseminated. • Management Framework (ESMF) tool applied • Quantitative indicators on Green gram sub-sector performance learnt and developed • Gender mainstreaming tool applied • Environmental and Social Management Framework (ESMF) tool used 	7 Hours
III	Policy issues in Green gram value chain		<ul style="list-style-type: none"> • Limited understanding of policy issues in the Green gram value chain 	5 hours 30 Minutes
	Total			98 hours

SECTION 3: TRAINING DESIGN

3.1 Delivery System

The delivery system designed for this training consists of two stages:

1. Establishment of a team of trainers

- » A Core Team of Trainers (CTT) trains farmer trainers (service providers) as trainers of a ToT course. This is done using this manual and modules contained therein.
- » Each of the Master trainers will facilitate farmers to acquire knowledge and skills in facilitating Farmer-led Field Schools (FFS) through practical demonstrations.

2. Upscaling –This will be done by selecting lead farmers (LF) to be trained in facilitation skills.

3.2 Partners and their Roles

The partners envisioned in this training plan are:

1. **Core Team of Trainers** – Master trainers drawn from KALRO, Universities and the State Department of Agriculture will facilitate initial training of farmer trainers. They will also provide mentorship to farmers' trainers during the first year of lead farmer training. They should also be available in the evaluation of the first round of lead farmer training.
2. **County Government Department of Agriculture** –Master trainers and their supervisors referred to as County Coordination Teams (CCT) to take the role of lead farmer trainers, mentors and coordinators at sub-county level. They will assist FFS's to form partnership with stakeholders for sustainability. They should also support LF's form their network.
3. **Lead Farmer Networks** - Association of LFs in the target counties to take up farmer training and upscaling in the future. Lead farmer networks and groups will conduct exchange visits to learn best practices in other project implementing counties.
4. **Private Sector Service Providers** – Inputs suppliers, financial and business development service providers, market players and processors to partner and support growth of individual or Green gram farmer groups.

3.3 Training Duration

The proposed initial ToT course for Master trainers for 13 modules in the Green gram value chain shall take a ToTal of 95 sessions with 98 hours of the training period. This does not include health breaks of mid-morning and afternoon.

3.4 Logic of Design and Flow of Session

The logic of design and flow of each module is that the trainer, paying attention to the proposed methods and sessions guidelines shall: (1) Introduce the module; (2) Determine the Trainees expectations; (3) Relate Trainees' expectations with module objectives or learning outcomes; (4) Explore the concept and content, switching to different methods of delivery of the content (group exercise, brainstorming, excursions, plenary discussions, role plays and demonstrations) as the session progresses; (5) Review the module at the end using participatory approaches; and, (6) Distribute handouts to the trainees.

SECTION 4: Trainer'S GUIDELINES

4.1 Preparation of Training Materials

The training materials suggested require adequate preparations and should be available before the actual training dates. In addition:

- a) The trainers should familiarize themselves and internalize the guidelines provided by this manual prior to the training.
- b) The stationery required should be available within the training institution one week before the training. These include name tags, writing materials, demonstrations materials and medium size box files for participants" handouts filing.
- c) Flip charts and good quality felt pens could be used interchangeably with LCD projections. Other materials and equipment and tools for demonstrations should also be arranged in time before the sessions start.
- d) Visual aids, field equipment and tools should also be arranged in time before the sessions start.
- e) There should be adequate copies of participants" handouts (one per trainee) to be distributed at the end of each session or as may be suitable.
- f) Copies of the modules shall be distributed at the end of each module.

4.2 Preparation of Training Venue and Sites

The training venue will include the training room, field/on-farm demonstration sites and market areas.

- a) **Training Room** – should have adequate space for 20 trainees seated in an arrangement that will ensure access and unobstructed view of the trainer. There should be adequate training materials, flip charts and flip chart holder. The LCD projector should also be available for the PowerPoint presentations.
- b) **Demonstration Site** – Should be within walking distance with at least adequate field for the planned demonstrations of technologies and their complementary management practices.
- c) **Market Sites** – these include Green gram retail outlets (grain stores, open air market and supermarkets), wholesale and aggregation points and processing sites if any. The operators should be informed in advance about the visits. These should not be very far away preferably less than 20 minutes' drive distance.

4.3 The Trainees

The trainees who will participate are extension officers, lead farmers, educators/universities, and researchers who are subject matter specialist with an elaborate training background in extension and advisory services. They will be drawn from public and

private sector based on considerable experience in training farmers but with minimal facilitative advisory or technology transfer approaches. The trainer should, therefore, act more of a trainer than a lecturer and draw out and build on their knowledge, skills and experience that they shall bring in. The trainer's role will be to facilitate and listen the trainees and let them feel like equals to each other and the CTT team members.

4.4 Training Program

The training program proposed consists of the actual training modules. Health breaks should be considered when drawing the training program. The training program should preferably be based on the outline presented in **Annex 1** to allow the flow of ideas and topics. However, should the situation demand, the sequence and day of coverage for whole or parts of the modules can be modified to suit emerging requirements? The training program assumes that the trainees report on to provide a program Sunday evening as the first day and leave days later.

4.5 Training Methods

The training methods proposed for each session are suitable for adult learners and appropriate for addressing knowledge, skills and attitudes of the trainees. The choice of the methods are informed by the competency issues being addressed, available time and experiences of the authors of this manual. Depending on time available, the trainer can modify these training methods but as a golden rule no presentation by the trainer should take more than 30 minutes continuously. To avoid monotony and boredom; the trainer should embrace other participatory training methods like participatory discussions, group exercises and brainstorming. Table 2 below present a list of available training methods.

Table 2: Description of training methods during Green gram ToT training

Training Method	Description of Method
Plenary presentations	Use of PowerPoint or flip charts and plenary discussions in situations where knowledge and opinion or consensus is required
Group exercises, visits and brainstorming sessions	To be considered where skills are an issue requiring sharing and trying
Role play and problem-solving exercises	Plenary discussions have been considered as training methods where attitude is an issue
On-farm practical demonstration	To be considered where hands-on practical skills are acquired through sharing and demonstration

4.6 Planning Schedule and Guidance for ToT preparation

While planning for this training, the CTT leader should ensure the following activities before the training commences as outlined in Table 3.

Table 3: Planning schedules and guidelines for ToT Preparation

Duration to Training	Activities to be Done
Six Weeks	Recruit master trainers, compose CTT, identify the practical demonstration sites
Four weeks	Send out invitation letters to trainees and special guests detailing purpose, venue and program. Follow up on demonstration sites. Brief CTT members
Two weeks	Confirm names of trainees; reproduce training materials for trainers and package, confirm preparedness of the field sites to be visited. Hold briefing of CTT members to finalize training plan. Confirm special guests if any
Four Days	Confirm training sites preparedness, prepare sitting arrangements, and brief assistants
One day	Arrange training room furniture, place materials, equipment and stationery on the tables. Arrange for the reception of trainees at residence proposed
On the first day	Arrange for the reception of trainees at the training venue. Ensure climate setting is done before the course is officially opened. This includes: <ul style="list-style-type: none"> • Registration • Welcome to the venue by host • Elaborate introduction of CTT and trainees; setting of ground rules • Formation of groups

4.7 Evaluation of Training

Half a day has been allocated for planning for way forward and evaluation of the ToT on the last day of the training. The evaluation strategy should take two directions. The first being the individual trainees evaluate through evaluation forms without conferring to each other (Table 4). The evaluation forms are then collected and analyzed by the CTT members.

Table 4: Individual Sample Evaluation Form

Aspect / Module	Rating		
	Very useful (3 marks)	Useful (2 marks)	Least useful (1 mark)
Climate Smart Agriculture			
Farmer field and business school (FFBS) approach in green gram production			
Green gram production niche			

Green gram variety selection			
Green gram seed system			
Green gram climate smart agronomic practices			
Integrated Soil and Water Management Practices for green gram			
Crop health			
Post-harvest Management			
Green gram value addition			
Mechanization of green gram production activities			
Green gram Business and Marketing			
Green gram Cross Cutting Issues			
i. Innovation Platforms			
ii. Gender mainstreaming and social inclusion			
iii. Policy Issues in green gram value chain			

The second evaluation is trainees' group evaluation. They retreat to one room and elect a chair and a secretary. They are asked to objectively and constructively evaluate the training in about 45 minutes in the absence of the CTT members. They then present their evaluation to the CTT members and as they present, the CTT members should only give points of clarifications if any misunderstanding occurred but not try to be defensive. The CTT members then use the two evaluation results to write a report highlighting aspects that went on well and can be replicated, challenges that were encountered, and opportunities for future ToT's improvement.

4.8 Participant's Training Notes and Reference Materials

4.8.1. List of green gram publications

The detailed list of all publications is summarized in **Annex 2**

4.8.2 Guide on the use of the information

During training, printed handouts should also be made available especially for major pests and diseases for easy identification. The trainers will be advised to issue farmers with at least one publication for each of the training sessions noting that many publications in one visit may be overwhelming and thus not able to consume the information given. However, those who are able to handle more than one publication can be allowed to take.

The list of all individual publications will be stored and available as electronic copies – mainly PDFs. The service providers are strongly advised to keep these electronic copies on a memory flash disk, CD or portable hard drive to enable farmers easily access and if necessary print any of them out at their convenient time.

Trainers will be advised to issue one general green gram farming manual to be accompanied by at least 2 other publications such as brochures and leaflets during training sections.

PART II

This part presents the content of **13 modules** of training, namely: (1) Climate Smart Agriculture, (2) Farmer field and business school (FFBS), (3) Green gram production niche, (4) Green gram variety selection, (5) Green gram seed system, (6) Green gram climate smart agronomic practices, (7) Integrated soil and water management practices for green gram, (8) Crop health (9) Post-harvest management, (10) Green gram value addition, (11) Mechanization of green gram production activities, (12) Green gram business and marketing, (13) Green gram cross cutting issues on innovation platforms, gender mainstreaming and social inclusion, policy issues.

All the modules are structured as follows:

- 1.1 Introduction to the Module
- 1.2 Module Learning Outcomes
- 1.3 Module Target Groups
- 1.4 Module Users
- 1.5 Module Duration
- 1.6 Module Summary
- 1.7 Trainer's Guidelines
- 1.8 Participant's Handouts

MODULE 1

CLIMATE CHANGE AND CLIMATE SMART AGRICULTURE

1.1 Introduction to the module

The cascading impact of climate change and variability on agriculture, food security and nutrition is a concern. Kenya's agricultural production system is highly impacted due to the low adaptive capacity and the high exposure to climate related risks. The major agricultural activities are prone to risks and uncertainties of nature which is affected by climate change either in intensity, scope or frequency. Climate change is expected to modify risks, vulnerabilities and the conditions that shape the resilience of agriculture systems as well as introducing new uncertainties. Adoption of climate smart agriculture (CSA) through application of tools and technologies and effective communications of weather information reduces the negative impacts of climate change and enhances access to food security in a changing environment. Thus, there is need to mainstream suitable climate resilient technologies, innovations and management practices (TIMPS) to increase productivity, resilience to climatic shocks and mitigate the causes of climate change.

1.2 Module Learning Outcomes

By the end of the module the following should be achieved:

- 1) The concept of climate change and variability explained and appreciated
- 2) Concept of Climate Smart Agriculture (CSA) described and understood
- 3) Impacts of climate change and variability on agriculture and food security explained and understood
- 4) Projected future climate scenarios and how to manage explained and understood.

1.3 Module Target Group

This module targets agricultural extension service providers dealing directly with farmer groups at community trainers.

1.4 Module users

The module is intended for use by master trainers who are members of the Core Team of Trainers (CTT). The trainers using this module should thoroughly familiarize themselves with the participants' handouts or training materials.

1.5 Module Duration

The Module is estimated to take about 4 hours and 30 minutes

1.6 Module Summary

Module 1: Climate Change and Climate Smart Agriculture in Green gram value chain			
Sessions	Training Methods	Training Materials	Time
1.6.1 Introduction to climate change and variability	<ul style="list-style-type: none"> • PowerPoint presentation • Case study videos • Plenary discussions 	<ul style="list-style-type: none"> • Projector • Laptop • Videos • Flip charts • Handouts 	1 hour
1.6.2 Impacts of climate change and variability on agriculture and food security	<ul style="list-style-type: none"> • PowerPoint presentation • Case study videos • Plenary discussions 	<ul style="list-style-type: none"> • Projector • Laptop • Videos • Flip charts • Handouts 	1 hour
1.6.3 Concept of Climate smart agriculture (CSA)	<ul style="list-style-type: none"> • PowerPoint presentation • Case study videos • Plenary discussions 	<ul style="list-style-type: none"> • Projector • Laptop • Videos • Flip charts • Handouts 	1 hour
1.6.4 Projected future climate scenarios and how to manage	<ul style="list-style-type: none"> • PowerPoint presentation • Case study videos • Plenary discussions 	<ul style="list-style-type: none"> • Projector • Laptop • Flip charts • Handouts 	1 hour
1.6.5 Module review	<ul style="list-style-type: none"> • Trainees' questions and comments • Trainers summary 	<ul style="list-style-type: none"> • Module review 	30 minutes
ToTAL			4 hours 30 minutes

1.7 Trainers Guidelines

Module 1: Climate change and climate smart agriculture in green gram value chain	
1.7.1. Introduction and levelling Expectations (1 hour) <i>(The trainer introduces the trainees to this module of climate change and climate smart agriculture and its important linkages. Thereafter, the trainer presents the module objectives)</i> Module Objectives By the end of the module the trainee should be able to: <ul style="list-style-type: none">• Explain climate change and adaptations.• Define 'climate smart agriculture'.• Identify and explain impacts of climate change and variability on agriculture and food security.• Understand projected future climate scenarios and how to manage them.	Session Guide <ul style="list-style-type: none">• PowerPoint presentation• Distribute participants' handouts on module objectives and expectations.
1.7.2 Introduction to climate change and climate variability (1 hour) Plenary presentation (30 Minutes) <i>(The trainer proceeds to introduce the module basics in a presentation).</i> <ul style="list-style-type: none">• Basic terminologies used in the module (weather, climate, variability, adaptation, coping)• Climate change and climate variability• The causes of climate change• Climate risks impacting agriculture• Proposed adaptation measures. Plenary Discussion (30 Minutes) Discussion on the session; field experiences, coping and adaptation mechanisms adopted by farmers.	Session guide <ul style="list-style-type: none">• PowerPoint presentation• Flip chart sketches• Plenary discussion

1.7.3 Concept of climate smart agriculture (CSA) – 1 hour <i>(The trainer presents to the trainees the principles underpinning CSA)</i>	Session Guide
Plenary presentation (45 Minutes) <ul style="list-style-type: none"> Definition of the CSA approach and their characteristics The three pillars of CSA (productivity, adaptation and mitigation) Why CSA is needed 	<ul style="list-style-type: none"> PowerPoint presentation Handouts Plenary discussion
Plenary Discussion (15 Minutes) Discussions on the CSA concept	
1.7.4 Projected future scenarios that will impact productivity (1 hour) <i>(The trainer presents and leads the trainees in discussing future climatic projections focusing on rainfall and temperature which directly impacts on crop yields.)</i>	Session Guide
PowerPoint and Plenary Discussion (45 minutes) <ul style="list-style-type: none"> The long term rainfall and temperature projections as impacted by climate change Project impacts on food production and needed adaptation measures 	<ul style="list-style-type: none"> PowerPoint Presentation Video presentation Plenary discussions
Video presentation (15 Minutes) <ul style="list-style-type: none"> Short Video on showing projections of rainfall and temperature 	
1.7.5 Module Review (30 minutes) <i>(The trainer leads the trainees in summarizing the key points discussed in the module).</i> Let the trainees recall the new items they have learnt in this module.	Session Guide Plenary discussion

1.8 Participants’ Handouts

- Green gram production Guide [Manual, 2020]
- Green gram leaflets [2020]
- Green gram fact sheets

References

Esilaba, A.O. et al. (2019). KCEP-CRAL Climate Smart Agriculture Extension Manual. Kenya Agricultural and Livestock Research Organization, Nairobi, Kenya

MODULE 2

FARMER FIELD AND BUSINESS SCHOOL (FFBS) APPROACH IN GREEN GRAM PRODUCTION

2.1 Introduction to the module

This module is designed for training and exposing trainees of Farmer Field and Business Schools (FFBS) to the Field school approach and concepts in agriculture. In addition, practitioners of FFBS need to have knowledge of this methodology in order to mainstream various Technologies, Innovations and Management Practices (TIMPs) in green gram production. The trainees will thereafter facilitate farmers in the Common Interest Groups (CIGs) to enable them share and learn by doing, try available technologies and innovations as they implement them on their farms. The FFBS also empower the learners with various skills such as leadership, communication and business. Since the methodology is participatory, it improves the learners' observation skills and creates linkages with other value-chain players thereby making Green gram production profitable and sustainable.

2.2 Module Learning Outcomes

By the end of the module the following should be achieved:

- 1) The concept, characteristics and principles of Farmer Field and Business School (FFBS) as a 'learning by doing approach' described and understood
- 2) The differences between teaching and facilitation explained and understood
- 3) The Agro ecosystems Analysis (AESA) on Green gram crop understood and applied
- 4) Knowledge on Participatory Technology Development (PTD) in Green gram TIMPs imparted and applied.

2.3 Module Target Group

The module targets public agricultural extension service providers based at sub-county and ward level and service providers

2.4 Module users

This module is intended for use by master trainers who are members of the Core Team of Trainers (CTT). The trainers using this module should thoroughly familiarize themselves with the participants' handouts or training materials

2.5 Module Duration

The module is estimated to take 7 hours

2.6 Module Summary

Module 2: Farmer Field and Business school (FFBS) approach in green gram production			
Sessions	Training Methods	Training Materials	Time
2.6.1 Introduction and levelling of expectations	<ul style="list-style-type: none"> • Group discussions • Presentation 	<ul style="list-style-type: none"> • Module objectives • Laptop • Projector • Marker pens, flip charts 	1 hour
2.6.2 Introduction to FFBS	<ul style="list-style-type: none"> • Brainstorming • Plenary presentation 	<ul style="list-style-type: none"> • Flip charts • Laptop • Projector • Pictorials 	1 hour
2.6.3 Designing an FFBS program	<ul style="list-style-type: none"> • Plenary presentations • Group Discussions and presentation 	<ul style="list-style-type: none"> • Laptop • Projector • Participants’ handouts 	1 hour
2.6.4 Key activities in FFBS	<ul style="list-style-type: none"> • Plenary session • Group discussions 	<ul style="list-style-type: none"> • Laptop • Projector • Flip charts • Handouts 	1hour 30 Minutes
2.6.5 Introduction to communication and facilitation skills	<ul style="list-style-type: none"> • Brainstorming • Plenary sessions • Group discussions 	<ul style="list-style-type: none"> • Laptop • Projector • Flip charts 	1 hour
2.6.6 Organization, management and leadership in FFBS	<ul style="list-style-type: none"> • Brainstorming • Plenary sessions • Group discussions 	<ul style="list-style-type: none"> • Laptop • Projector • Flip charts • Handouts 	1 hour
2.6.7 Module review	<ul style="list-style-type: none"> • Participants’ questions and comments • Trainers’ summary 	<ul style="list-style-type: none"> • Participants’ handouts • Module review 	30 minutes
ToTAL			7 hours

2.7 Trainers Guidelines introduction to FFBS

Module 2: Farmer Field and Business School (FFBS) approach in green gram production	
2.7.1 Introduction and levelling expectations (1 hour)	Session Guide
<p>Introduction (15 Minutes)</p> <p><i>(The trainer welcomes trainees to the module on FFBS Approach in Green gram Production and introduces him/herself stating his profile and experience of working with farmers).</i></p> <p><i>The trainer invites the trainees to state their expectations and thereafter presents module objectives.</i></p> <p>Module Objectives (45 Minutes)</p> <p>By the end of the module the trainee should be able to:</p> <ul style="list-style-type: none"> • Describe the concepts, characteristics, principles and plans of Farmer Field and Business School (FFBS) as a ‘learning by doing’ approach • Identify main differences between teaching and facilitation • Be able to conduct Agro systems Analysis (AES) on Green gram crop • Successfully lay Participatory Technology Development (PTD) in Green gram TIMPs. 	<ul style="list-style-type: none"> • Summarize trainees’ “expectations” on a flipchart and make displays. • PowerPoint presentation
2.7.2 Introduction To FFBS (1 hour)	Session Guide
<p><i>(The trainer introduces FFBS by defining it and sharing its benefits with the trainees).</i></p> <p>Plenary Presentation (1 hour)</p> <ul style="list-style-type: none"> • History of Farmer Field and Business Schools • Principles of FFBS • Characteristics of FFBS • Concepts of FFBS • Objectives of FFBS • Benefits of FFBS 	<ul style="list-style-type: none"> • Powerpoint presentation • Participants’ handouts • Q&A session

2.7.3 The Key FFBS activities Steps in conducting FFBS (1 hour)	Session Guide
Plenary Presentation (15 Minutes) <ul style="list-style-type: none"> • The concept of Agro Ecosystem Analysis (AES)A • Participatory Technology Development • Group Dynamics • Special Topics in FFBS • Field daily Guide • Green gram curriculum matrix 	<ul style="list-style-type: none"> • Powerpoint presentation • Participants' handouts • Group discussion • Q&A session
Group work (45 Minutes) <p>Each group comes up with probable special topics to be covered within the learning period.</p>	
2.7.4 Designing an FFBS program (1 hour 30 Minutes)	Session Guide
<p><i>(Trainer guides discussions on the steps of preparation and establishment of FFBS)</i></p> Plenary Presentation (30 Minutes) <p>The classical steps</p> <ul style="list-style-type: none"> • Ground working • Training of Trainers • Establishing PTDs at the FFBS • Season long FFBS sessions • Evaluation of PTDs • Field days • Graduation • Establishment of Lead Farmer FFBS • Follow-ups <p>Group Exercise (1 hour)</p> <p>Steps in establishing FFBS in the community. Within the groups follow trainer instructions.</p>	<ul style="list-style-type: none"> • Distribute participants' pandouts • Hand out on procedure of ground working • PowerPoint presentation • Group exercise • Q&A session

2.7.5 Communication skills (1 hour)	Session Guide
<p>Plenary presentation (15 Minutes)</p> <p><i>(The trainer introduces the topic on communication and why effective communication is necessary).</i></p> <ul style="list-style-type: none"> • What is effective communication? • Purpose of communication • Barriers to effective communication • Maintaining communication within group (FFBS) 	<ul style="list-style-type: none"> • PowerPoint presentation • Q&A session • Group Exercise
<p>Group work (45 Minutes)</p> <p>Group exercise on communication.</p>	
2.7.6 Facilitation skills (1 hour)	Session Guide
<p><i>(The trainer introduces the topic on Facilitating adult learners).</i></p> <p>Plenary presentation (1 hour)</p> <p>Facilitating Green gram CIGs</p> <ul style="list-style-type: none"> • Definition of Facilitation, facilitate and effective trainer • Qualities of a good trainer • Golden rules of trainer • Roles and responsibilities of FFBS trainers • Adult Non- formal learning techniques 	<ul style="list-style-type: none"> • Powerpoint presentation • Handout on adult learning techniques • Q&A session
2.7.7 Organization, management and Leadership of FFBS (1 hour)	Session Guide
<p>Plenary presentation (30 minutes)</p> <p><i>(The trainer introduces the topic by asking the trainees how their groups are organized, managed and leadership structures).</i></p> <ul style="list-style-type: none"> • Leadership continuum- subjects, environment and leader • Existing leadership structure • Roles and responsibilities of leaders • Leadership and sustainability in groups 	<ul style="list-style-type: none"> • PowerPoint presentation • Plenary discussion • Q&A session

2.7.8. Module Review (30 minutes)	Session Guide
<p><i>(The trainer leads the trainees in reviewing the module)</i></p> <ul style="list-style-type: none"> • What new things did you learn from this module? • What are some of the problems and issues that you have become more aware of? In FFBS, problems are seen as challenges, how would we identify the priority problem in the community? • And how would we address it? • Why farming business proposition? • Are there unanswered questions? <p>Let the trainees recall the new items they have learnt in this module.</p>	<ul style="list-style-type: none"> • The last participants” Handouts/training materials • Summarize the main points of the module on a flip chart and display • Module Evaluation

2.8 Participants” Handouts

1. FFBS Guide
2. FFBS fact sheets
3. Green gram Production Guide (Manual,2020).
4. Green gram leaflets (2020).
5. Green gram fact sheets.

References

1. FAO Government Cooperative Program: Farmer Field and Farm Business Schools. Manual for Preparation and Establishment of Farmer Field and Farm Business Schools
2. FAO: Farmer Field School Methodology, a ToT Manual
3. Khisa Godrick: Farmer Field School Methodology, Training of Trainers Manual.
4. Sustainet East Africa: Farmer Field School, A Technical Manual
5. Training Manual on Good Agricultural Practices in Potato using Farmer Field and Business School Approach: KALRO AND GiZ initiative

MODULE 3

GREEN GRAM PRODUCTION NICHES AND CLIMATIC REQUIREMENTS

3.1 Introduction

This module exposes service providers and lead farmers trainers to the different types of production ecological (altitudes, soils, AEZs and climatic conditions) suitable for Green gram production in the selected counties. Green gram farming is done mostly under rain-fed conditions by smallholder farmers. The crop is either grown as sole (mono crop) or as an intercrop with dryland cereals (sorghum, millet and maize). The production systems are guided by the size of the farm, objective of the production (e.g., for market or contract farming where farmers produce for seed companies) and the market demand.

3.2 Module Learning outcomes

By the end of the module training, the following should be achieved:

1. The importance of green gram in Kenya's economy understood and appreciated
2. Knowledge of altitudes and soil types/characteristics for green gram production understood.
3. The climatic conditions (temperatures, rainfall and humidity) required for green gram production understood and applied
4. The specific county agro-ecological zones for green gram production explained and understood

3.3 Module Target Group

This module is intended for public agricultural extension providers in the Green gram value chain target counties and service providers.

3.4 Module users

This module is intended for use by master trainers who are members of the Core Team of Trainers (CTT) and Lead Farmers in the green gram value chain target counties. The trainer using this module should thoroughly familiarize themselves with the participants' handouts (training materials).

3.5 Module Duration

The module is estimated to take 6 hours

3.6 Module Summary

Module 3: Green gram production niches and climatic requirements			
Sessions	Training methods	Training materials	Time
3.6.1 Introductions and climate setting	<ul style="list-style-type: none"> ▪ Presenter introduction ▪ Self-introduction of trainees (incl. individual involvement in Green gram) ▪ Plenary discussion 	<ul style="list-style-type: none"> ▪ Flips charts ▪ Felt pens ▪ Projector ▪ Laptop for PowerPoint Presentation 	30 minutes
3.6.2 Objectives and expectations	<ul style="list-style-type: none"> ▪ Presentations ▪ County group exercise (trainees enlist expectations) ▪ Plenary discussions 	<ul style="list-style-type: none"> ▪ Flips charts ▪ Felt pens ▪ Projector ▪ Laptop for PowerPoint Presentation 	30 minutes
3.6.3 Importance of green gram in Kenya's economy	<ul style="list-style-type: none"> ▪ Presentations ▪ Plenary discussions 	<ul style="list-style-type: none"> ▪ Flips charts ▪ Felt pens ▪ Projector ▪ Laptop for PowerPoint Handouts Training notes) 	1 hour
3.6.4 Green gram production ecological/climatic requirements for optimal yields	<ul style="list-style-type: none"> ▪ Presentations ▪ Plenary discussions 	<ul style="list-style-type: none"> ▪ Flips charts ▪ Felt pens ▪ Projector ▪ Laptop for PowerPoint presentations ▪ Handouts (training notes) 	1 hour

3.6.5 Green gram production Agro-ecological zones (AEZs)- average yields, and constraints in the target Counties	<ul style="list-style-type: none"> ▪ Group work to identify Green gram production pockets in their sub-Counties/Counties ▪ Presentations ▪ Plenary discussions 	<ul style="list-style-type: none"> ▪ Flips charts ▪ Felt pens ▪ Projector ▪ Laptop for PowerPoint presentations 	2 hours
3.6.6 Green gram module review	<ul style="list-style-type: none"> ▪ Discussions/conclusion and way forward 	<ul style="list-style-type: none"> ▪ Flip charts ▪ Projector ▪ Laptop for PowerPoint presentations 	1 hour
Total			6 hours

3.7 Trainer's Guidelines

Module 3: Green gram production and appropriate climatic requirements	
3.7.1 Introductions and climate setting (30 minutes)	Session Guide
<i>(The trainer welcomes trainees to the module and introduces himself/herself are then invited to introduce themselves and state their past or current involvement in green gram production along the enterprise value chain.)</i>	<ul style="list-style-type: none"> • Summarize the trainer/trainees involvement in Green gram value chains
3.7.2 Objectives and expectations (30 minutes)	
<p><i>The trainer invites the trainees to state their expectations and thereafter presents module objectives:</i></p> <p>Expectations (45 minutes)</p> <p>The trainees go into groups (e.g. county based) and list expectations.</p> <p>Objectives (15 minutes)</p> <p>By the end of the module the trainee should be able to:</p> <ul style="list-style-type: none"> • Define the importance of green gram in Kenya's economy. • Indicate and describe altitudes and soil types/ characteristics for green gram production. • Describe climatic conditions (temperatures, rainfall and humidity) required for green gram production. • Explain specific county agro-ecological zones for green gram production. 	<ul style="list-style-type: none"> • PowerPoint presentations • Group exercise (listing and presenting expectations). • Expectations lists kept for later reviewing compliance

3.7.3 Importance of Green gram in Kenya's economy (1 hour; 30 minutes)	
Plenary Presentation (1 hour) <ul style="list-style-type: none"> Origin and place of Green gram as crop Why Green gram in Kenyan households Key counties producing Green gram in Kenya General Green gram production in Kenya 	<ul style="list-style-type: none"> PowerPoint presentation Distribute to participants' handouts (training materials)
Trainer's guided discussions (30 minutes) Questions/answers/comments	
3.7.4 Green gram production ecological/climatic requirements (1 hour; 30 minutes)	
Plenary Presentation (1 hour) <ul style="list-style-type: none"> Altitude and Agro-ecological zones Climatic conditions (rainfall, temperatures and humidity) Soils (soil types, pH, general fertility for green gram) 	<ul style="list-style-type: none"> PowerPoint presentation Distribute to participants' handouts (training materials)
Trainer's guided discussions (30 minutes) Questions/answers/comments	

3.7.5. Green production AEZs (villages), average yields, and constraints in the target Counties (2 hours)	Session Guide
Plenary Presentation (30 Minutes)	<ul style="list-style-type: none"> PowerPoint presentations
<p><i>Trainer guides trainees in reviewing and discussing suitability map (County by County).</i></p>	<ul style="list-style-type: none"> Group work
Group work (1 hour)	<ul style="list-style-type: none"> Open but trainer's guided discussions
<p>Trainees to bring out specific county or sub-county AEZs, land size, yields and constraints to Green gram production and present in the plenary:</p> <ul style="list-style-type: none"> Agro-ecological zones (AEZs) and % area suitable for green gram Average land/farm size under green gram Average green gram yield per farm Constraints to green gram production. 	
Discussions/presentations from the groups (30 minutes)	
<p>Let the trainees/groups share the group exercise outcomes</p>	
3.7.6. Module review (1 hour)	Session Guide
<p><i>(The trainer leads the trainees in reviewing the module)</i></p>	<ul style="list-style-type: none"> The last participants' handouts/training materials
<p>Summary of the main points from the training (1 hour)</p>	<ul style="list-style-type: none"> Summarize the main points of the module on a flip chart and display
<ul style="list-style-type: none"> Objectives and expectations (review on basis of the earlier listed objectives and expectations). Green gram production ecological/climatic requirements Green gram production AEZs (villages) average yields, and constraints in the target counties. Randomly (average of 10 cases), trainees indicate new thing(s) learned from the module. The results are recorded per county presented. Randomly (average of 10 cases) trainees pin-point the way forward issues. 	
Trainer's guided discussions (30 minutes)	

3.8 Participants' Handouts

Green gram production Guide [Manual, 2020]

- Green gram leaflets [2020]
- Green gram fact sheets

MODULE 4

GREEN GRAM VARIETY SELECTION

4.1 Introduction to the Module

This module exposes service providers, lead farmers and trainers to the available commercial green gram varieties developed and released for cultivation in different agro-ecological zones. This includes variety names, variety special attributes factors to consider when selecting the seed, target environment and appropriate regions for optimal yield. This module also introduces the trainees on seed selection for uniform germination, the difference between different varieties, the determination of seed viability, select the appropriate spacing both inter and intra row spacing in order to acquire the collect plant density and avoid seed wastage.

4.2 Module Learning outcomes

By the end of the module training, the following should be achieved:

1. The available commercial green gram varieties and their special attributes described and understood
2. The suitable environments for growing green gram explained and understood
3. Knowledge on appropriate spacing for optimal plant density enhanced
4. The green gram varietal identification explained and understood.

4.3 Module Target Group and Categories

The target users are service providers, public/private agent change officers and the lead farmers.

4.4 Module Users

This module is intended for use by master trainers who are members of the Core Team of Trainers (CTT). The trainer using this module should thoroughly familiarize themselves with the participants' handouts.

4.5 Module Duration

The module is estimated to take 4 hours and 30 minutes.

4.6 Module Summary

Module 4: Green gram Variety Selection			
Sessions	Training methods	Training materials	Time
4.6.1 Introduction, objectives and expectations	<ul style="list-style-type: none"> ▪ Self-introduction ▪ Presentations ▪ Plenary discussions 	<ul style="list-style-type: none"> ▪ Flips charts ▪ Projector ▪ Laptop 	1 hour
4.6.2 Improved Green gram varieties and their appropriate niche	<ul style="list-style-type: none"> ▪ PowerPoint Presentations ▪ Plenary discussions (The trainees review. Trainees bring out the observation from different varieties and describe them) ▪ Group work 	<ul style="list-style-type: none"> ▪ Samples of seeds for different varieties ▪ Flips charts ▪ Laptop for PowerPoint presentation ▪ Participants' Handouts ▪ Projector 	2 hours
4.6.3 Target Green gram plant spacing for optimal plant density	<ul style="list-style-type: none"> ▪ Powerpoint presentations ▪ Plenary discussions 	<ul style="list-style-type: none"> ▪ Flips charts ▪ Laptop ▪ Handouts 	1 hour
4.6.4 Module review	<ul style="list-style-type: none"> ▪ Discussions and conclusion 	<ul style="list-style-type: none"> ▪ Flip Charts 	30 minutes
Total			4 hours 30 minutes

4.7 Trainers' Guidelines

Module 4: Green gram varietal selection	
4.7.1 Introduction, levelling of expectations and objectives (1 hour)	Session Guide
<p>Introduction (30 minutes)</p> <p><i>(The trainer welcomes trainees to the module on main Green gram varietal selection. They are then invited to introduce themselves and state their expectations).</i></p> <p><i>(The trainer presents modules objectives).</i></p> <p>Module Objectives (30 minutes)</p> <p>By the end of the module the trainee should be able to:</p> <ol style="list-style-type: none"> 1. Describe the available commercial green gram varieties and their special attributes 2. Explain the suitable environments for growing green gram 3. Appreciate appropriate spacing for optimal plant density 4. Appreciate the green gram varietal identification in form colour, size, etc. 	<ul style="list-style-type: none"> • Trainees list their expectations summarize these and make a plenary presentation • PowerPoint presentation • Distribute participants' handouts • Module objectives and training program
4.7.2 Green gram improved varieties and their appropriate niche (2 hours)	Session Guide
<p><i>(The trainer presents on the available improved Green gram varieties and their main characteristics and suitable areas for cultivation).</i></p> <p>Plenary Presentation (1 hour 30 Minutes)</p> <p>Present on the critical attributes which include: names of the varieties, their characteristics, yield performance, special attributes and suitable regions for cultivation.</p> <p>Discussion (30 minutes)</p> <p>Let the trainees recall what they learned and discuss any issues that may arise.</p>	<ul style="list-style-type: none"> • PowerPoint Presentation • Distribute Participants' handouts • Fact sheet information on varieties

4.7.3 Target Green gram plant density (1 hour)	Session Guide
Plenary Presentation (45 minutes) <ul style="list-style-type: none"> Green gram spacing and their required seed rate for optimal yield. Factors to consider when determining seed rate Importance of having proper plant spacing 	<ul style="list-style-type: none"> PowerPoint presentation Distribute participants' handouts fact sheet, manuals
Discussion (15 minutes) Let the trainees recall what they learned and discuss any issue that may arise.	
4.7.4 Module review (30 minutes)	Session Guide
<i>(The trainer leads the trainees in reviewing the module)</i> Summarize the main points of the training and together with the trainees review the main points on: <ul style="list-style-type: none"> Improved green gram varieties and their attributes Target areas for green gram cultivation Amount of green gram seed required for a given area. <p>(Discuss with trainees new things learn from this module. What are some of the problems and issues that they have become more aware of in the module?)</p>	<ul style="list-style-type: none"> The last participants' handouts Summarize the main points from the module on a flip chart and display

4.8 Participants' Handouts

- Green gram production Guide [Manual, 2019] available under KCEP-CRAL
- Green gram leaflets [2017]
- Green gram fact sheets

MODULE 5

GREEN GRAM SEED SYSTEM

5.1 Introduction to the Module

Green gram farmers mostly recycle their own seed or source from their local market and grain stores, with a small percentage purchasing certified seed. Continued use over many years of own saved seed makes production of improved varieties (especially self-pollinated crops) uneconomical, thus undermining the incentives for private sector investment in commercial production and marketing of such seeds. This in turn has limited the dissemination of improved high-quality seed of Green gram. The mode of own-saved seed system is only suited for subsistence production. As rural life becomes more commercialized and global markets become more competitive, farmers need to shift from subsistence agriculture to commercial grain production. This module exposes service providers, lead farmers and trainers to the various seed systems in Green gram production. The module also covers the importance of quality seed, how to improve on Green gram seed provision. It also covers community seed production and gives direction on how to interface formal and informal seed production to enable farmers venture into commercial grain production.

5.2 Module learning outcomes

By the end of the module the following should be achieved:

1. The main Green gram seed systems in Kenya explained and appreciated
2. Knowledge on Green gram seed production in formal and informal seed system enhanced and applied
3. The importance of informal seed system, community seed bulking and its interface with formal seed production for enhanced production of quality grain explained and understood.

5.3 Module Target Group and Categories

This module is intended for service providers and county public extension agents.

5.4 Module Users

The module is intended for use by master trainers who are members of the Core Team of Trainers (CTT). The trainer using this module should thoroughly familiarize themselves with the participants' handouts.

5.5 Module Duration

The module is estimated to take 5 hours and 30 minutes.

5.6 Module Summary

Module 5: Green gram Seed System			
Sessions	Training methods	Training materials	Time
5.6.1 Introduction, objectives and expectations	<ul style="list-style-type: none"> ▪ Personal introductions ▪ Presentations ▪ Plenary discussions 	<ul style="list-style-type: none"> ▪ Flips charts ▪ Felt pens ▪ Laptop ▪ Projector 	30 minutes
5.6.2 Definition of seed and seed system in Kenya	<ul style="list-style-type: none"> ▪ Group work ▪ Presentations 	<ul style="list-style-type: none"> ▪ Laptop ▪ Projector ▪ Flips charts ▪ Laptop ▪ Projector 	1 hour
5.6.3 Formal seed system in Kenya	<ul style="list-style-type: none"> ▪ Presentations ▪ Discussions 	<ul style="list-style-type: none"> ▪ PowerPoint Presentation ▪ Flips charts ▪ Felt pens 	1 hour 30 minutes
5.6.4 Informal seed system in Kenya	<ul style="list-style-type: none"> ▪ Presentations ▪ Discussions 	<ul style="list-style-type: none"> ▪ PowerPoint Presentation ▪ Flips charts ▪ Felt pens 	1 hours 30 minutes
5.6.5 Module review and discussions	<ul style="list-style-type: none"> ▪ Group work ▪ Discussions ▪ presentation 	<ul style="list-style-type: none"> ▪ Flips charts 	1 hour
Total			5 hours 30 minutes

5.7 Trainers' Guidelines

Module 5: Green gram Seed System	
5.7.1. Introduction and levelling of expectations and objectives (1 hour)	Session Guide
<p>Introduction (30 minutes)</p> <p><i>(The trainer welcomes trainees to the module on main Green gram seed system. They are then invited to introduce themselves and state their expectations)</i></p> <p>5.7.1. Module Objectives (30 minutes)</p> <p><i>(The trainer presents modules objectives)</i></p> <p>By the end of the module the trainee should be able to:</p> <ul style="list-style-type: none"> • To Sensitize trainees on Green gram seed systems and its importance in production • To Sensitize trainees on seed production in formal and informal seed system • Understand the Importance of informal seed system, community seed bulking and its interface with formal seed production for enhanced production of quality grain. 	<ul style="list-style-type: none"> • Summarize trainees' "expectations" and display. • PowerPoint presentation • Distribute participants' handouts on module objectives and training program
5.7.2. Definition of seed and seed system in Kenya (1hour)	Session Guide
<p>Group work and presentations: (30 Minutes)</p> <ul style="list-style-type: none"> • What is quality seed? <p>Plenary Presentation (30 Minutes)</p> <ul style="list-style-type: none"> • What is a seed system and characteristics of main seed systems (formal and informal seed system) • Commodity corridors 	<ul style="list-style-type: none"> • Group work • PowerPoint presentation • Distribute participants' handouts • Brochures, leaflets,
5.7.3 Formal seed system in Kenya (1 hour 30 Minutes)	Session Guide
<p>Plenary presentations highlighting (1 hour 30 Minutes)</p> <ul style="list-style-type: none"> • Legal requirements for seed certification • Seed certification process • Post certification activities for enforcing the seed act cap 326 • Post control activities for seed quality assurance • Seed importation and exportation requirements. 	<ul style="list-style-type: none"> • PowerPoint presentation • Distribute participants' handouts • Brochures, leaflets

5.7.4 Informal seed system in Kenya (1 hour 30 Minutes)	Session Guide
Plenary presentations: (1 Hour) <ul style="list-style-type: none"> • Seed multiplication • Green gram seed standards and commercial production • informal seed system • Community seed bulking and how is it implemented • Synergies for formal and informal seed system 	<ul style="list-style-type: none"> • Group work • PowerPoint presentation • Distribute participants' handouts • Brochures, leaflets,
Group work and discussions (30 Minutes) Calculate seed requirements for the county/ward/farmer group) and present	
5.7.5 Module review (30 minutes)	Session Guide
<i>(The trainer leads the trainees in reviewing the module).</i> Summarize the main points of the training and together with the trainees review the main points on: <ul style="list-style-type: none"> • Green gram seed systems and their characteristics • Importance of using certified seed • Informal seed <i>(Discuss with trainees new things learn from this module. What are some of the problems and issues that they have become more aware of in the module?)</i>	<ul style="list-style-type: none"> • The last participants'" handouts • Summarize the main points from the module on a flip chart and display

5.8 Participants" Handouts

- Green gram production guide [Manual, 2019] available under KCEP-CRAL
- Green gram leaflets [2017]
- Green gram fact sheets

MODULE 6

GREEN GRAM CLIMATE SMART AGRONOMIC PRACTICES

6.1 Introduction

Green gram is widely grown in semi-arid areas of Kenya. It is an annual leguminous crop and plays an important role as relay crop as well as a short rains season crop. The crops perform best at altitude between 0-1600m above sea level, and under warm climatic conditions. Thus green gram are drought tolerant and gives reasonable yields with as little as 650mm of annual rainfall. Heavy rains and cool temperatures result in increased vegetative growth with reduced pod setting and development. The crops do well on fertile loam soils, but grow reasonably well on not too exhausted sandy soils. The crop is mainly grown for seeds (grains) which are highly nutritious as human food. They also provide revenue to the smallholder farmers. In addition, the crops fix atmospheric nitrogen into the soil, - improving soil fertility. Though important, the crops are cultivated with limited inputs or/and agronomic practices. This leads to farm level low grain yields. This module exposes agricultural extension service providers, lead farmers and trainers to the most appropriate climate smart agronomic practices for improved Green gram production in Kenya.

6.2 Module Learning outcomes

By the end of the module training, the following should be achieved:

1. The agronomic practices or crop husbandry for green gram production explained and applied.
2. Inputs (seed, fertilizers, manures, herbicides and pesticides) and their right dosages for green gram production understood and described.
3. Knowledge and skills on the right timing for various operations (land preparation, seeding weeding, pest control and harvesting) or inputs (seed, fertilizers, manures, pesticides) application in Green gram production enhanced and applied.

6.3 Module Target Group and Categories

This module is intended for public agricultural extension providers in the green gram value chain target counties.

6.4 Module users

This module is intended for use by master trainers who are members of the Core Team of Trainers (CTT). The trainer using this module should thoroughly familiarize themselves with the participants' handouts or training materials.

6.5 Module Duration

The module is estimated to take 6 hours.

6.6 Module Summary

Module 6: Green gram climate smart agronomic practices			
Sessions	Training methods	Training materials	Time
6.6.1 Introductions and climate setting	<ul style="list-style-type: none">Presenter introductionsSelf-introduction of trainees (incl. individual involvement in Green gram)Plenary discussions	<ul style="list-style-type: none">Flips chartsFelt pensProjectorLaptop for PowerPoint Presentation	30 minutes
6.6.2 Objectives and expectations	<ul style="list-style-type: none">Presentations (guide on group work)Group work (trainees enlist expectations) Plenary discussions to share expectations	<ul style="list-style-type: none">Flips chartsFelt pensProjectorLaptop for PowerPoint Presentation	1 hour
6.6.3 Agronomic practices for Green gram production	<ul style="list-style-type: none">PowerPoint presentationsPractical work (groups tour nearby farm for possible farm layout)Plenary discussions resulting from the farm visit	<ul style="list-style-type: none">Flips chartsFelt pensProjectorLaptop for PowerPoint Presentation	2 hours
6.6.4 Appropriate inputs and their dosages in Green gram optimal production	<ul style="list-style-type: none">PowerPoint presentationsGroup work (trainees enlist inputs and dosage in different counties)Plenary discussions to share group work results	<ul style="list-style-type: none">Flips chartsProjectorLaptop for PowerPoint PresentationParticipants’ Handouts	1 hour 30 minutes
6.6.5 Module review and discussion	<ul style="list-style-type: none">Discussions/conclusion and way forward	<ul style="list-style-type: none">Flip chartsProjectorLaptop for PowerPoint presentations	1 hour
Total			6 hours

6.7 Trainers' Guidelines

Module 6: Green gram climate smart agronomic practices	
6.7.1 Introduction, levelling of expectations and objectives (1 Hour. 20 minutes) <i>(The trainer welcomes trainees to the module. Introduces him/herself. The trainees are then invited to introduce themselves and state their past or current involvement in green gram production along the enterprise value chain).</i>	Session Guide <ul style="list-style-type: none">Summarize the trainer/trainees involvement in green gram value chainsPowerPoint presentationsGroup exercise (listing and presenting expectations).Expectations lists kept for later reviewing
Objectives (30 Minutes) <i>(The trainer presents module objectives).</i> By the end of the module the trainee should be able to: <ol style="list-style-type: none">Define agronomic practices or crop husbandry for green gram production.Describe inputs (seed, fertilizers, manures, herbicides and pesticides) and their right dosages for green gram production.Indicate the right timing for various operations (land preparation, seeding weeding, pest control and harvesting) or inputs (seed, fertilizers, manures, pesticides) application in green gram production.	
Expectations (50 minutes) The trainees go into groups (e.g. county based) and list expectations from the module.	
6.7.2 Agronomic practices for Green gram production (2 hours) Plenary Presentation (1 Hour 30 minutes) <i>(The trainer presents critical factors on: factors for selecting Green gram as an enterprise; land preparation, seeding, thinning, weed control, pests control; rogueing; cropping systems; spacing (inter-and intra-row spacing), planting methods; conservation agriculture principles/benefits; time for the various operations, and others).</i>	Session Guide <ul style="list-style-type: none">PowerPoint PresentationGroups discussionsDistribute participants' handouts/training materials
Discussions (30 minutes) Questions/answers and comments.	

6.7.3. Appropriate inputs for green gram optimal production and their correct doses (1 hour; 30 minutes)	Session Guide
Group work (30 minutes) <i>(The trainer guides trainees to list or/and present the required inputs for use in green gram production).</i> <ul style="list-style-type: none"> • The trainees get into county groups to provide lists of green gram inputs and their rates used by farmers. • The groups present their results in the plenary, - opening up for some questions, answers and discussions. Plenary presentation (1 hour) <i>The trainer present PowerPoint presentation on the recommended Green gram inputs (seeds, fertilizers, manures, etc.) and their rates, and their time of application for optimal yields of Green gram.</i>	<ul style="list-style-type: none"> • PowerPoint Presentation • Distribute handout to participants' • Groups discussions handouts/training materials
6.7.4. Module review (1 hour) <i>(The trainer leads the participants' in reviewing the module).</i> Summary for the main points from the training <ul style="list-style-type: none"> • Objectives and expectations (review done on basis of the earlier listed objectives and expectations) • Randomly (average of 10 cases), trainees indicate new things learned from the module. The results are recorded per county presented • Randomly (average of 10 cases) trainees pin-point the way forward issues. 	Session Guide <ul style="list-style-type: none"> • The last Participants' Handouts/training materials • Summarize the main points of the module on a flip chart and display

6.8 Participants' Handouts

- Green gram production Guide [Manual, 2020] available under KCEP-CRAL
- Green gram leaflets [2020]
- Green gram fact sheets

MODULE 7

INTEGRATED SOIL AND WATER MANAGEMENT PRACTICES FOR GREEN GRAM PRODUCTION

7.1 Introduction

The performance of the agriculture sector in Kenya has continued to decline over the years due to increased soil acidity, mining of nutrients not supplied in the applied fertilizers, lowering of the soil organic matter content caused by non-use organic resources. Macronutrients (nitrogen (N), phosphorus (P), potassium (K) and Sulphur (S) and micronutrients zinc (Zn), Molybdenum (Mo) and Boron (B)) have been identified as deficient in Kenyan soils. Additionally, climate change has accelerated the decline of the agricultural sector performance through limited and unpredictable water supply to crop production systems. Integrated Soil Fertility Management (ISFM) which includes conservation agriculture offers the best options for improving soil fertility while allowing for climate change adaptation.

Green gram is mostly cultivated by smallholder farmers with minimal inputs. Drought management technologies to mitigate drought effects in the green gram production are available. However, farmers have not realized the full benefits due to limited integration of the developed integrated natural resource management (INRM) and sustainable intensification practices in their green gram production systems.

This module introduces service providers, lead farmers and trainers to the importance of integrated soil and water management practices for enhanced green gram production.

7.2 Module learning outcomes

By the end of the module, the following training outcomes should be achieved:

1. Knowledge on soil composition, the various physical, chemical and biological properties and what constitutes a healthy soil including soil classification acquired
2. Soil and plant tissue sampling for laboratory analysis, interpretation and utilization of results and also identification of accredited laboratories in Kenya discussed and understood
3. Soil fertility and plant nutrition for increased crop productivity (R4 Stewardship that includes fertilizer source, rates, application methods and timing) understood
4. Knowledge on soil health and Integrated Soil Fertility Management (ISFM) for climate resilient cropping systems (conservation agriculture, cereal legume intercrops, rotation, organic amendments, manure and composting) acquired
5. Knowledge on water harvesting technologies, soil and water management

acquired

6. Knowledge and skills for identifying temporary or permanent decline of land productive capacity and provide various solutions to soil degradation imparted and understood
7. Awareness on the occurrence of problematic soils and their management increased and understood by the trainees.

7.3 Module Target Group and Categories

This module is intended for service providers and county public extension agents in the Green gram producing areas.

7.4 Module Users

This module is intended for use by master trainers who are members of the Core Team of Trainers (CTT). The trainer using this module should thoroughly familiarize themselves with the participant's handouts.

7.5 Module Duration

The Module is estimated to take a minimum of 9 hours

7.6 Module Summary

Module 7: Integrated soil and water management practices for Green gram production			
Sessions	Training methods	Training materials	Duration
7.6.1 Introduction, objectives and expectations	<ul style="list-style-type: none">▪ Personal introductions▪ Presentations▪ Plenary discussions	<ul style="list-style-type: none">▪ Flips charts▪ Laptop▪ Projector	30 minutes
7.6.2 Soil composition, properties and health	<ul style="list-style-type: none">▪ Presentations▪ Field demonstrations	<ul style="list-style-type: none">▪ Flips charts▪ Laptop▪ Projector▪ Hand outs	1 hour
7.6.3 Soil and plant tissue sampling and analysis	<ul style="list-style-type: none">▪ Presentations▪ Field demonstrations	<ul style="list-style-type: none">▪ Flips charts▪ Laptop▪ Projector▪ Handouts	1 hour 30 minutes

7.6.4 Soil fertility and plant nutrition	<ul style="list-style-type: none"> ▪ Presentations ▪ Field demonstrations 	<ul style="list-style-type: none"> ▪ Flips charts ▪ Laptop ▪ Projector ▪ Participants' handouts 	1 hour
7.6.5 Soil health and ISFM for climate resilient cropping systems	<ul style="list-style-type: none"> ▪ Presentations ▪ Field demonstrations 	<ul style="list-style-type: none"> ▪ Flips charts ▪ Laptop ▪ Projector ▪ Participants' handouts 	1 hour
7.6.6 Soil and water management and water harvesting technologies	<ul style="list-style-type: none"> ▪ Presentations ▪ Field demonstrations 	<ul style="list-style-type: none"> ▪ Flips charts ▪ Laptop ▪ Projector ▪ Participants' handouts 	1 hour
7.6.7 Soil degradation and reclamation	<ul style="list-style-type: none"> ▪ Presentations ▪ Field demonstrations 	<ul style="list-style-type: none"> ▪ Flips charts ▪ PowerPoint presentation ▪ Participants' handouts 	1 hour
7.6.8 Problematic soils and their management	<ul style="list-style-type: none"> ▪ Presentations ▪ Field demonstrations 	<ul style="list-style-type: none"> ▪ Flips charts ▪ Laptop ▪ Projector ▪ Participants' handouts 	1 hour
7.6.9 Module review and discussion	Discussions	<ul style="list-style-type: none"> ▪ Flips charts 	1 hour
Total			9 hours

7.7 Trainers' Guidelines

Module 7: Integrated soil and water management practices for green gram production	
7.7.1 Introduction, objectives and expectations (30 minutes)	Session Guide
<p><i>(The trainer welcomes trainees to the module on sustainable water and soil fertility management practices for Green gram optimal production in moisture stressed conditions. They are then invited to introduce themselves and state their expectations).</i></p> <p>Module Objectives</p> <p><i>(The trainer presents modules objectives).</i></p> <p>By the end of the module the trainee should be able to:</p> <ul style="list-style-type: none"> • Describe and explain soil composition, properties and health for green gram. • Describe and explain soil and plant tissue sampling and analysis for green gram. • Describe soil fertility and plant nutrition for green gram. • Explain soil health and (ISFM) for climate resilient cropping systems for green gram. • Identify soil and water management and water harvesting technologies for green gram. • Identify soil degradation and reclamation for green gram. • Describe problematic soils and their management for green gram. 	<ul style="list-style-type: none"> • Summarize participants' "expectations" and display. • PowerPoint presentation • Distribute handouts to participants' • on the module objectives and training program
7.7.2. Soil composition, properties and health (1 hour)	Session Guide
<p><i>(The trainer presents on soil composition, properties and health).</i></p> <p>Plenary Presentation (45 minutes)</p> <p>Soil composition, properties and health</p> <ul style="list-style-type: none"> • Description of soil composition • Description of soil properties • Describe what soil health is all about <p>Discussion (15 minutes)</p> <p>Let the trainees recall what they learned and discuss any issues that may arise.</p>	<ul style="list-style-type: none"> • PowerPoint presentation • Distribute handouts to participants' • Brochures, leaflets and manual

7.7.3 Soil and plant tissue sampling and analysis (1 hour 30 minutes)	Session Guide
<p>Plenary Presentation (45 Minutes)</p> <p>PowerPoint presentation highlighting the following:</p> <ul style="list-style-type: none"> • Overview of the soil sampling methods • Soil analysis results and interpretation • Overview of soil analysis results using available examples • Soil sampling guidelines 	<ul style="list-style-type: none"> • PowerPoint presentation • Distribute handouts to participants' • Brochures, leaflets and manuals <ul style="list-style-type: none"> • Practical demonstration
<p>Practical exercise on soil sampling (45 minutes)</p> <p>Demonstrations on soil sampling method</p>	Session Guide
<p>7.7.4 Soil fertility and plant nutrition (1 hour and 30 minutes)</p> <p>Plenary Presentation (1 hour)</p> <p>PowerPoint presentation highlighting:</p> <ul style="list-style-type: none"> • Potential role of different soil managements techniques in addressing soil fertility challenges in Green gram smallholder farming systems • Integrated soil fertility management techniques • Soil management guidelines <p>Discussion (30 Minutes)</p> <p>Let the trainees recall what they learned and discuss any issues that may arise.</p>	<ul style="list-style-type: none"> • PowerPoint presentation • Participants' presented with handouts, brochures, leaflets and manuals

7.7.5 Soil health and (ISFM) for climate resilient cropping systems (1 hour 30 minutes)	Session Guide
Plenary Presentation (45 minutes) PowerPoint Presentation Highlighting: <ul style="list-style-type: none"> • Trainees to have an insight on soil health • Introduce integrated soil fertility management (ISFM) • To relate soil health and ISFM for a climate resilient cropping system • Introduce manure management, mulching, organic amendments and composting for increased use of organic manure for improving agricultural production • Introduce conservation agriculture as a climate smart agriculture practice • To relate cereal legume intercrops and crop rotation as climate resilient cropping systems Discussion (45 minutes) Let the participants' recall what they learned and discuss any issue that may arise.	<ul style="list-style-type: none"> • PowerPoint Presentation • Trainees presented with handouts, brochures, leaflets and manuals
7.7.6 Soil and water management and water harvesting technologies (1 hour 30 minutes)	Session Guide
Plenary Presentation (1 Hour) <ul style="list-style-type: none"> • Principles of soil management for increased crop productivity • Methods of tillage systems that conserve water for crop use. • Introduce the principles of soil fertility management for increased crop productivity • Methods of soil fertility management for increased crop productivity. Discussion (30 Minutes) Let the trainees recall what they learned and discuss any issues that may arise.	<ul style="list-style-type: none"> • PowerPoint Presentation • Participants' presented with handouts, brochures, leaflets and manuals

7.7.7 Soil degradation and reclamation (1 hour)	Session Guide
Plenary Presentation <ul style="list-style-type: none"> • Overview of soil degradation and reclamation. • Causes of soil degradation • Reclamation measures of degraded soil • Identification of the causes of soil degradation • Identification of Reclamation measures of degraded soil 	<ul style="list-style-type: none"> • PowerPoint Presentation • Distribute Handouts to participants' • Brochures, leaflets and manual
Discussion (15 Minutes) <p>Let the trainees recall what they learned and discuss any issues that may arise.</p>	
7.7.8 Problematic soils and their management (1 hour)	Session Guide
Plenary Presentation <ul style="list-style-type: none"> • Problematic soils and their management • Soils with unsuitable biological properties • Soils with unsuitable chemical properties • Soils with unsuitable physical properties 	<ul style="list-style-type: none"> • PowerPoint presentation • Distribute Handouts to participants' • Brochures, leaflets and manual
Discussion (15 Minutes) <p>Let the trainees recall what they learned and discuss any issues that may arise.</p>	
7.7.9. Module review (1 hour) <p><i>The trainer leads the trainees in reviewing the module)</i></p>	Session Guide
<p>Summarize the main points of the training and together with the trainees in each of the sub topics.</p> <p><i>(Discuss with trainees about new things learnt from this module. What are some of the problems and issues that they have become more aware of in the module)?</i></p>	<ul style="list-style-type: none"> • The last Participants’ Handouts • Summary of the main points on from the module on a flip chart and display

7.8 Participants’ Handouts

- Green gram Extension Manual [KCEP-CRAL Manual, 2019]
- Green gram Leaflets [KCEP-CRAL Manual, 2019]
- Green gram fact sheets

MODULE 8

CROP HEALTH

8.1 Introduction to the module

Green gram diseases and pests are important biotic constraints which are known to cause significant yield losses in Green gram growing regions. Farmers hardly control pests and diseases and when they do, they do not apply the recommended dose of pesticides leading to resistance thus ineffectiveness. This module exposes service providers, lead farmers and trainers to the importance of maintaining crop health in Green gram production. The module introduces the major Green gram pests and diseases and their distribution in Kenya. It also unveils the economic losses caused by the mentioned pests and diseases. Finally, the module gives details of the recommended sustainable integrated pests and diseases management practices that if applied can help reduce the yield losses.

8.2 Module Learning outcomes

By the end of the module training, the following should be achieved:

1. Knowledge on identification of major green gram pests of economic importance including emerging and migratory ones enhanced and shared
2. The sustainable integrated green gram pests management (IPM) practices and scouting for threshold determination explained and understood
3. Knowledge on pre-disposing factors of major green gram diseases enhanced
4. Knowledge on identification of the symptoms for specific diseases common in green gram producing areas enhanced and applied and shared
5. Knowledge and skills on Integrated Disease Management (IDM) of green gram enhanced
6. Knowledge on safe use of pesticides and source of up to date registered pesticides enhanced and applied.

8.3 Module Target Group and Categories

This module is intended for service providers and county public extension agents.

8.4 Module Users

This module is intended for use by master trainers who are members of the Core Team of Trainers (CTT). The trainer using this module should thoroughly familiarize themselves with the participants’ handouts.

8.5 Module Duration

The module is estimated to take 10 hours

8.6 Module Summary

Module 8: Crop Health			
Sessions	Training methods	Training materials	Time
8.6.1 Introduction, objectives and expectations	<ul style="list-style-type: none"> ▪ Personal introduction ▪ Group work ▪ Presentations ▪ Plenary discussions 	<ul style="list-style-type: none"> ▪ Flips charts ▪ Laptop ▪ Projector 	30 minutes
8.6.2 Major Green gram pests that cause economic losses and their control methods; emerging/migratory (fall armyworm, locusts) pests	<ul style="list-style-type: none"> ▪ Group work ▪ Presentations ▪ Plenary discussions ▪ Practical Session 	<ul style="list-style-type: none"> ▪ Flips charts ▪ Laptop ▪ Projector ▪ Participants' handouts 	2 hours
8.6.3 Sustainable Integrated Green gram pests management practices; scouting, post-harvest pests and threshold determination	<ul style="list-style-type: none"> ▪ Presentations ▪ Plenary discussions ▪ Field Demonstration ▪ Presentation 	<ul style="list-style-type: none"> ▪ Flips charts ▪ Laptop ▪ Projector ▪ Participants' handouts 	1 hours 30 minutes
8.6.4 Major Green gram diseases that cause economic losses, conditions that favour their development and control methods	<ul style="list-style-type: none"> ▪ Group work ▪ Presentations ▪ Plenary discussions ▪ Practical Session 	<ul style="list-style-type: none"> ▪ Flips charts ▪ Laptop ▪ Projector ▪ Participants' Handouts 	2 hours
8.6.5 Sustainable Integrated Green gram diseases management; scouting and threshold determination	<ul style="list-style-type: none"> ▪ Presentations ▪ Plenary discussions ▪ Field Demonstration 	<ul style="list-style-type: none"> ▪ Flips charts ▪ Laptop ▪ Projector ▪ Participants' handouts 	2 hours
8.6.6 Safe use of pesticides and update source for registered pesticides	<ul style="list-style-type: none"> ▪ Presentations ▪ Practical ▪ Plenary discussions 	<ul style="list-style-type: none"> ▪ Flips charts ▪ Laptop ▪ Projector ▪ Participants' handouts 	1 hour 30 Minutes

8.6.7 Module Review	<ul style="list-style-type: none"> ▪ Discussions/ Recap of module ▪ Take away messages 	<ul style="list-style-type: none"> ▪ Flips charts ▪ Sharing of presentations 	30 minutes
Total			10 hours

8.7 Trainers' Guidelines

Module 8: Green gram crop health	
8.7.1. Introduction and levelling of expectations and objectives (30 Minutes)	Session Guide
<p>Introduction</p> <p><i>(The trainer welcomes trainees to the module on green gram crop health. They are then invited to introduce themselves and state their expectations).</i></p> <p>Module Objectives</p> <p><i>(The trainer presents modules objectives)</i></p> <p>By the end of the module the trainee should be able to:</p> <ul style="list-style-type: none"> • Identify major green gram pests that cause economic losses. • Describe and explain sustainable Integrated green gram pests management (IPM) practices and scouting for threshold determination. • Appreciate pre-disposing factors of major green gram diseases. • Identify the symptoms for specific diseases common in green gram producing areas. • Attain skills in Integrated Disease Management (IDM) of green gram. • Gain knowledge on safe use of pesticides and source of up to date registered pesticides. 	<p>Session Guide</p> <ul style="list-style-type: none"> • Summarize trainees' "pxpectations" and display. • PowerPoint presentation • Distribute participants' handouts on module objectives and training program

8.7.2 Major green gram pests that cause economic losses and their control methods; emerging/migratory pests (2 hours)	Session Guide
<i>(The trainer presents on the commonly known green gram pests that are of economic importance).</i>	
Group work (30 minutes) <ul style="list-style-type: none"> Trainees avail green gram pest information from their counties. 	<ul style="list-style-type: none"> PowerPoint presentation Group work Practical session Distribute participants' handouts Brochures, leaflets and manual Printed photos of various pests, brochures
Plenary Presentation (30 minutes) <ul style="list-style-type: none"> PowerPoint presentation on the critical aspects which include: pest names and descriptions, symptoms of their infestation/type of damage, data on losses caused by the pests. 	
Practical session (30 minutes) <ul style="list-style-type: none"> Identification of green gram pests from provided specimens. 	
Discussion (30 minutes) <ul style="list-style-type: none"> Let the trainees recall what they learned and discuss any issue that may arise. 	
8.7.3 Sustainable integrated green gram pests management practices; scouting, post-harvest pests and threshold determination (1 hour 30 minutes)	Session Guide
Plenary Presentation 45 minutes <ul style="list-style-type: none"> Critical areas to consider including scouting and when to implement green gram disease control measures. Overview of Aflatoxins in pulses and the effect of damage from cereal pests. Integrated Disease Management (IDM) in green gram. 	<ul style="list-style-type: none"> PowerPoint presentation by group representatives on information on scouting for pests Distribute participants' handouts (brochures,
Plenary discussions (15 minutes) <ul style="list-style-type: none"> Let the trainees recall what they learned and seek clarification on the principles of sustainable IPM options. 	<ul style="list-style-type: none"> Leaflets and manuals on pest specimens on green gram
Field Visit (30 minutes) <ul style="list-style-type: none"> Visit nearby field to collect and identify diseased samples 	

8.7.4 Major Green gram diseases that cause economic losses, conditions that favour their development and their control methods (2 hour)	Session Guide
Group work (30 minutes) <ul style="list-style-type: none"> Determine green gram diseases in specific counties Plenary Presentation (30 Minutes) <ul style="list-style-type: none"> Presentations on green gram diseases and conditions that favour their development Practical Exercise (1 hour) <ul style="list-style-type: none"> Identification of major disease species causing economic damage based on samples presented 	<ul style="list-style-type: none"> PowerPoint presentation by representative group leaders Distribute participants' handouts (brochures, leaflets or printed photos of the major diseases) Disease identification guidelines Printed photos of the major diseases Practical Exercise
8.7.5 Sustainable Integrated Diseases Management (IDM) ; scouting and threshold determination (2 hours)	Session Guide
Plenary Presentation (1 hour) <ul style="list-style-type: none"> Critical areas to consider including scouting and when to implement green gram disease control measures Overview of Aflatoxins in pulses and the effect of damage from cereal pests Integrated Disease Management (IDM) in green gram. Plenary discussions (20 minutes) <ul style="list-style-type: none"> Let the trainees recall what they learned and seek clarification on the principles of sustainable IPM options. Field Visit (40 minutes) <ul style="list-style-type: none"> Visit nearby field to collect and identify diseased samples. 	<ul style="list-style-type: none"> PowerPoint presentation by trainer and representative group leaders on information on scouting for diseases Distribute participants' handouts (brochures, leaflets and manuals) Disease management guidelines
8.7.6 Safe use of pesticides and update source for registered pesticides (1 hour 30 Minutes)	Session Guide

<p>Plenary presentation (30 minutes)</p> <ul style="list-style-type: none"> • Presentation on safe use of pesticides • Let the trainees ask questions on any of the covered topical issues and critical areas to share with farmers on safe use of pesticides <p>Practical Session (30 minutes)</p> <ul style="list-style-type: none"> • Ways currently used by farmers in mixing of pesticides/ ITK products; and their consideration on safe use of pesticides <p>Practical Demonstration (30 minutes)</p> <p>Proper use of knap sack sprayer, protective gear and calibration of pesticides, sourcing for registered pesticide information online: on PCPB website</p>	<ul style="list-style-type: none"> • PowerPoint presentation by trainer and representative group leaders • Distribute participants' handouts (brochures, leaflets and manuals) • Disease management guidelines • Practical demonstration
<p>8.7.7 Module review (30 Minutes)</p> <p><i>(The trainer leads the trainees in reviewing the module).</i></p> <p>Summarize the main points of the training</p> <p>Together with the trainees review the main points about climatic conditions suitable for Green gram production.</p> <ul style="list-style-type: none"> • Green gram major pests and their economic losses • Green gram Integrated Pest Management (IPM) • Green gram major diseases and their economic losses • Green gram Integrated Disease Management (IDM). <p>(Discuss with trainees about new things learnt from this Module. What are some of the issues that need clarification)?</p>	<p>Session Guide</p> <ul style="list-style-type: none"> • The last Participants'' Handouts • Summarize the main points from the module on a flip chart and display

8.8 Participants'' Handouts

- Pest identification and control factsheet
- Disease identification and control factsheet

References

- Pest Control Products Board (2018). Pest Control products registered for use in Kenya.
http://cacafrica.com/Public/Home/xiazai/PCPB%20List%20of%20Registered%20Products%20Version%201_2019.pdf

MODULE 9

GREEN GRAM POST HARVEST MANAGEMENT

9.1 Introduction to the module

Inappropriate post-harvest handling practices, poor storage methods and pest infestation are major production constraints that cause both qualitative and quantitative losses to Green gram. Postharvest losses of grains in Kenya are estimated at 30%, translating to more than US\$ 4 billion loses annually. These reduce the gains from investments made on grain productivity enhancement. Postharvest losses are caused by lack of knowledge on appropriate postharvest technologies, innovations and management practices. Green gram bruchid assume greater importance as it damages the grain in the field and during storage. Large scale dissemination of the available climate smart technologies (TIMPs) through farmer awareness, training and demonstrations can reduce these losses. This module introduces service providers and lead farmer trainers to the goal of postharvest management, Green gram postharvest value chain, post-harvest losses (quantitative and qualitative), factors that contribute to the losses and the available sustainable management techniques climate smart and gender friendly TIMPs for minimizing the losses and enhancing quality of the grain.

9.2 Module learning outcomes

By the end of the module, the following should be achieved:

1. Goal of postharvest management explained and understood
2. Maturity indices for green gram described and explained
3. Best harvesting practices for quality grain understood and applied
4. The postharvest handling practices for green gram described and understood
5. The constraints in green gram postharvest handling, and suggested solutions explained and understood
6. Knowledge on green gram post-harvest losses (both quantity and quality), their causes, and link to greenhouse gas emissions enhanced
7. Knowledge on Climate Smart Post-harvest TIMPs to reduce losses and attain best quality enhanced.

9.3 Module Target Group and Categories

This module is intended for service providers and county public extension agents.

9.4 Module Users

This module is intended for use by master trainers who are members of the Core Team of

Trainers (CTT). The trainer using this module should thoroughly familiarize themselves with the participant's handouts.

9.5 Module Duration

The Module is estimated to take a minimum of 8 hour and 30 Minutes, divided into 40% theory and 60% practical exercise

9.6 Module Summary

Module 9: Green gram Post Harvest Management			
Sessions	Training methods	Training materials	Duration
9.6.1 Introduction, objectives and expectations	<ul style="list-style-type: none"> ▪ Personal introductions ▪ Group work ▪ Presentations ▪ Plenary discussions 	<ul style="list-style-type: none"> ▪ Flips charts ▪ Laptop ▪ Projector 	30 minutes
9.6.2. Green gram harvesting	<ul style="list-style-type: none"> ▪ Presentations ▪ Group work ▪ Plenary discussions ▪ Presentations 	<ul style="list-style-type: none"> ▪ Flip charts ▪ Laptop ▪ Projector ▪ Videos ▪ Participants' Handouts 	1 hour 30 minutes
9.6.3 Constraints in postharvest handling of green grams, and suggested solutions	<ul style="list-style-type: none"> ▪ Group discussions ▪ Presentations ▪ Plenary discussions 	<ul style="list-style-type: none"> ▪ Flip charts ▪ Laptop ▪ Projector ▪ Videos 	1 hour
9.6.4 Green gram postharvest chain	<ul style="list-style-type: none"> ▪ Group work ▪ Brainstorming sessions ▪ Presentations ▪ Practical demonstration 	<ul style="list-style-type: none"> ▪ Flip charts ▪ Laptop ▪ Projector ▪ Videos ▪ Participants' Handouts 	3 hours

9.6.5 Green gram post-harvest losses and the economic importance (food security, and link to greenhouse gas emissions)	<ul style="list-style-type: none"> ▪ Presentations ▪ Plenary discussions 	<ul style="list-style-type: none"> ▪ Laptop ▪ Projector ▪ Participants' Handouts ▪ Videos 	1 hour
9.6.6 Climate smart Post-harvest TIMPs to reduce losses, and attain best quality, 7 higher prices	<ul style="list-style-type: none"> ▪ Presentations ▪ Plenary discussions 	<ul style="list-style-type: none"> ▪ Laptop ▪ Projector ▪ Participants' Handouts ▪ Materials for demos (green grams, moisture meters, hermetic bags, metal silos, etc.) ▪ Video 	1 hour
9.6.7 Module review	<ul style="list-style-type: none"> ▪ Presentations ▪ Plenary discussions ▪ Demonstrations 	<ul style="list-style-type: none"> ▪ Flips charts ▪ Laptop ▪ Projector ▪ Have the expectations been achieved? ▪ Module evaluation forms 	30 minutes
Total			8 hours 30 minutes

9.7 Trainers' Guidelines

Module 9: Green gram post harvest management	
9.7.1 Introduction, objectives and expectations (30 minutes)	Session Guide
<p><i>(The trainer welcomes trainees to the module on green gram harvesting and post-harvest management that help reduce the post-harvest losses and attain best quality. The trainees are invited to introduce themselves and state their expectations).</i></p> <p>Module Objectives</p> <p>The trainer presents modules objectives.</p> <p>By the end of the module the trainee should be able to:</p> <ul style="list-style-type: none"> • Explain the goal of postharvest management • Describe and explain maturity indices for green gram • Apply best harvesting practices for quality grain • Describe the whole range of postharvest handling practices for green gram • Discuss constraints in green gram postharvest handling and suggest solutions • Appreciate green gram post-harvest losses (both quantity and quality), their causes, and link to greenhouse gas emissions • Apply climate Smart Post-harvest TIMPs to reduce losses and attain best quality 	<ul style="list-style-type: none"> • Summarize trainees' "expectations" and display. • PowerPoint presentation • Distribute participants' handouts on module objectives and training program
9.7.2. Green gram harvesting (1 hours 30 Minutes)	Session Guide
<p>Group work (20 minutes)</p> <p><i>(Maturity indices for green gram (i.e. how do farmers know that their green gram crop is ready for harvesting)?</i></p> <ul style="list-style-type: none"> • Harvesting practices <p>Group Presentation (30 minutes)</p> <p>Trainees present results of group work in plenary</p> <p>PowerPoint presentation (30 minutes)</p> <ul style="list-style-type: none"> • Maturity indices for green gram • Harvesting practices <p>Discussion (10 Minutes)</p> <p>Let the trainees recall what they learned and discuss any issues that may arise.</p>	<ul style="list-style-type: none"> • PowerPoint presentation • Distribute participants' handouts • Brochures, leaflets and manual • Group work

9.7.3 Constraints in postharvest handling of Green gram, and suggested solutions (1 hour)	Session Guide
Group work (45 Minutes) <ul style="list-style-type: none"> • Trainees discuss constraints in the postharvest handling of Green gram, and suggested solution 	<ul style="list-style-type: none"> • PowerPoint presentation
Group presentation (15 Minutes) <ul style="list-style-type: none"> • Trainees discuss results of group work in plenary 	<ul style="list-style-type: none"> • Distribute participants' handouts • Group work

9.7.4 Green gram postharvest value chain (3 hours)	Session Guide
Group work (20 minutes) Trainees discuss activities in green gram postharvest chain in the respective counties / regions.	<ul style="list-style-type: none"> PowerPoint presentation
Group presentation (20 minutes) Trainees present results of group work in the plenary	<ul style="list-style-type: none"> Distribute participants' handouts
PowerPoint presentation (30 minutes) <ul style="list-style-type: none"> Harvesting Drying for threshing Checking if drying is appropriate – use of moisture meters, the “salt method” for grain moisture determination Threshing Winnowing Drying for storage (sun drying on tarpaulins, solar dryers, electric dryers) The correct moisture content for storage Mycotoxin contamination due to inappropriate drying (economic and public health impacts). 	<ul style="list-style-type: none"> Brochures, leaflets and manual
Video on threshing (10 minutes) Trainees watch a video on threshing of Green gram	<ul style="list-style-type: none"> Moisture meters
Practical demonstrations (30 minutes) <ul style="list-style-type: none"> Threshing Grain moisture determination (salt method, hygrometers, grain moisture meters) 	<ul style="list-style-type: none"> Hermetic bags (PICS, Agro-Z)
PowerPoint presentation (30 minutes) <ul style="list-style-type: none"> Sorting and grading Destoning machines Grading (Kenya Standards for Grading Green gram for Human Consumption)Green gram stores – design and location; protection against pests, e.g. rat-proof Cages / cribs for protection of hermetic bags Precautions during storageStock maintenance – Fist In First Out (FIFO) Storage pests (bruchids and weevils) – losses caused, preventive and control measures Insect traps for control of storage pests Acoustic technology for early detection of grain storage pests 	<ul style="list-style-type: none"> Plastic drums
	<ul style="list-style-type: none"> Metal silos
	<ul style="list-style-type: none"> De-stoning machines
	<ul style="list-style-type: none"> Green gram thresher
	<ul style="list-style-type: none"> Green gram (for threshing practical)
	<ul style="list-style-type: none"> Threshed green gram (for sorting and grading practical)
	<ul style="list-style-type: none"> Video

<ul style="list-style-type: none"> Practical demonstrations (30 minutes) Sorting and grading (a sample of Green gram purchased from the market and grading into various grades with reference to the Kenya Standards / East African Standard (EAS) Hermetic storage - use of hermetic bags (various types available to farmers, e.g. PICS, Agro-Z, etc.), plastic drums, metal silos Video on grain storage (10 minutes) Participants' Trainees watch video on hermetic bags, metal silo and grain storage. 	
9.7.5. Green gram post-harvest losses (1 Hour)	
Plenary Presentation (30 minutes) <ul style="list-style-type: none"> Green gram post-harvest losses (quantity, quality) and their economic implications in Green gram production, consumption and marketing; link of postharvest losses and Greenhouse gas emissions. Plenary Discussion (30 Minutes) <p>Let the trainees recall what they learned and discuss any issue that may arise.</p>	<ul style="list-style-type: none"> Powerpoint presentation Distribute participants' handouts Brochures, leaflets and manual
9.7.6. Post-harvest management practices (1 hour)	Session Guide
Plenary Presentation (15 min) <ul style="list-style-type: none"> Overview of post-harvest management option Sustainable post-harvest management techniques Postharvest management guidelines Practical exercise (45 min) <p>Demonstrations on management options</p>	<ul style="list-style-type: none"> Powerpoint presentation Distribute participants' handouts Brochures, leaflets and manual Practical demonstration

9.7.7. Module review (30 minutes)	Session Guide
<p><i>The trainer leads the trainees in reviewing the module)</i></p> <p>Summarize the main points of the training and together with the trainees review the main points:</p> <ul style="list-style-type: none"> • Objectives and goal of postharvest management in agriculture • Maturity indices for Green gram • Appropriate Green gram harvesting methods for quality grains • Meaning of postharvest, and the whole range of postharvest handling practices for Green gram • Constraints in Green gram postharvest handling, and suggested solution • Green gram post-harvest losses (quantity, quality), causes, prevention, and link to Greenhouse gas emissions • Sustainable climate smart post-harvest TIMPs to reduce losses, attain best quality and higher prices. <p>(Discuss with trainees about new things learnt from this module. What are some of the problems and issues that they have become more aware of in the module)?</p>	<ul style="list-style-type: none"> • The last participants’ handouts • Module evaluation forms • Summary of the main points on from the module on a flip chart and display • Take home messages

9.8 Participants' Handouts

- Green gram Manual
- Green gram facts sheets on Post harvest

MODULE 10

GREEN GRAM VALUE ADDITION

10.1 Introduction to the module

Micronutrient malnutrition is a major challenge affecting women and children. Grain legumes such as Green gram have been proven to lessen ‘hidden hunger’ and are a principal part of global human diet. They constitute 33 % of dietary protein requirements which is twofold under subsistence conditions. Green gram is a key legume and a source of protein, folate and iron and a component of starch-based diets among underprivileged communities. Its nutritive value is more compared to other primary protein sources and staples. This module introduces service providers, lead farmers and trainers to the importance of Green gram in addressing food security and nutrition at the household level, community level and industrial level. The module also covers constraints in value addition and consumption of Green gram and their suggested solutions, and various Green gram value added products that can be easily made at the household level which, if adopted, can help increase the Green gram consumption at the household level. The module is also valuable for community level and industrial processing of Green gram.

10.2 Module Learning outcomes

By the end of the module training, the following outcomes should be achieved:

1. Role of green gram as a food and nutrition security crop explained and understood
2. Knowledge on nutritional composition of green gram, impact of consumption on health, food security and income enhanced
3. Constraints in value addition and consumption of green gram, and suggested solutions described and understood
4. Knowledge on making green gram-based value added products imparted and applied.

10.3 Module Target Group and Categories

This module is intended for service providers and county public extension agents.

10.4 Module Users

This module is intended for use by master trainers who are members of the Core Team of Trainers (CTT). The trainer using this module should thoroughly familiarize themselves with the participant’s handouts.

10.5 Module Duration

The module is estimated to take 6 hours

10.6 Module Summary

Module 10: Green gram value addition			
Sessions	Training methods	Training materials	Duration
10.6.1 Introduction, objectives and expectations	<ul style="list-style-type: none"> ▪ Personal introduction ▪ Group work ▪ Presentations ▪ Plenary discussions 	<ul style="list-style-type: none"> ▪ Flips charts ▪ Felt Pens ▪ Laptop ▪ Projector 	30 minutes
10.6.2 Role of Green gram as a food and nutrition security crop	<ul style="list-style-type: none"> ▪ Presentations ▪ Group work ▪ Plenary discussions 	<ul style="list-style-type: none"> ▪ Laptop ▪ Projector ▪ Participants' Handouts 	1 hour
10.6.3 Green gram nutritional composition and its role in human health	<ul style="list-style-type: none"> ▪ Presentations ▪ Plenary Discussions ▪ Group work ▪ Demonstrations 	<ul style="list-style-type: none"> ▪ Laptop ▪ Projector ▪ Participants' Handouts 	1 hour
10.6.4 Constraints in value addition and consumption of Green gram, and suggested solutions	<ul style="list-style-type: none"> ▪ Group discussions ▪ Presentations ▪ Plenary discussions 	<ul style="list-style-type: none"> ▪ Flip charts ▪ Laptop ▪ Projector 	1 hour
10.6.5 Green gram-based value added products	<ul style="list-style-type: none"> ▪ Presentations ▪ Group Discussions ▪ Hands-on practical demonstrations ▪ Field visit to processing firms / groups 	<ul style="list-style-type: none"> ▪ Laptop ▪ Projector ▪ Participants' handouts / recipes ▪ Assorted value addition equipment and ingredients ▪ Sensory evaluation forms 	1 hour 30 minutes

10.6.6 Module review and discussion	<ul style="list-style-type: none"> ▪ Plenary Discussions ▪ presentations 	<ul style="list-style-type: none"> ▪ Flips charts ▪ Laptop ▪ Projector ▪ Have the expectations been achieved? ▪ Module evaluation forms 	30 minutes
Total			5 hours 30 minutes

10.7 Trainers' Guidelines

Module 10: Green gram value addition	
10.7.1 Introduction, Objectives and Expectations (30 Minutes)	Session Guide
<p><i>(The trainer welcomes trainees to the module on green gram consumption and development of value added products at the household level, group level and industrial level. They are then invited to introduce themselves and state their expectations)</i></p> <p>Module Objectives</p> <p><i>(The trainer presents modules objectives).</i></p> <p>By the end of the module the trainee should be able to:</p> <ul style="list-style-type: none"> • Appreciate the role of green gram as a food security and nutritional crop. • Explain nutritional composition of green gram and impact on human health. • Describe constraints in value addition and consumption of green gram, and suggest solutions. • Explain how to make green gram-based value added products. 	<ul style="list-style-type: none"> • Summarize trainees' "expectations" and display. • Powerpoint presentation • Distribute participants' handouts on module objectives and training program

10.7.2. Role of Green gram as a food security and nutritional crop (1 hour)	Session Guide
<p><i>(The trainer presents on malnutrition cases in Kenya and importance of green gram in addressing food security and malnutrition challenges).</i></p>	<ul style="list-style-type: none"> • powerpoint presentation • distribute participants' handouts • brochures, leaflets and manual, factsheets, posters
<p>Plenary Presentation (30 Minutes)</p> <p>PowerPoint presentation highlighting the critical elements which include:</p>	
<ul style="list-style-type: none"> • Micronutrient malnutrition cases in Kenya • Dietary nutrient requirements (focusing on VMGs), food nutrient deficiency symptoms, sources of nutrients and their implication in human health. 	
<p>Group work and Discussions (30 Minutes)</p> <p>Trainees discuss in groups, the main malnutrition challenges in their respective counties / regions.</p>	
10.7.3. Green gram nutritional composition and their intake impact in human health (1 hour)	Session Guide
<p>Plenary Presentation (30 Minutes)</p> <ul style="list-style-type: none"> • Overview of the documented Green gram nutritional composition and their role in human health • Nutrient guidelines and nutritional requirements for different VMGs • Health benefits of Green gram consumption. 	<ul style="list-style-type: none"> • Powerpoint presentation • Distribute participants' handouts • Brochures, leaflets and manual, factsheets, posters
<p>Group work (30 minutes)</p> <ul style="list-style-type: none"> • What are the constraints in consumption of Green gram, and suggested solutions? • What are the health benefits of Green gram consumption 	
<p>Discussion (15 Minutes)</p> <p>Let the trainees recall what they learned and discuss any issue that may arise.</p>	

10.7.4 Constraints in value addition and consumption of Green gram, and suggested solutions (1 hour)	Session guide
Group work (30 Minutes) <p>Groups discuss the constraints in green gram value addition and consumption</p> Plenary presentation (30 Minutes) <p>Overview of constraints in value addition and consumption in green gram</p>	<ul style="list-style-type: none"> • Leaflets, • PowerPoint presentation • Manuals
10.7.5 Green gram-based Value added products (1 hour 30 Minutes)	Session guide
Plenary Presentation (30 Minutes) <ul style="list-style-type: none"> • Overview of the Green gram value added products • Meaning of value addition • Importance of value addition • Requirements for value addition of Green gram • Green gram based value added products; sensory evaluation of value added products Practical exercise (1 hour) <ul style="list-style-type: none"> • Demonstration on formulation of Green gram value added products • Practical on sensory evaluation of Green gram value added products 	<ul style="list-style-type: none"> • PowerPoint Presentation • Distribute Participants' Handouts • Brochures, leaflets and manual, • Recipes • Sensory evaluation forms • Assorted value addition equipment and ingredients • Practical demonstration

10.7.6 Module review (30 min)	Session Guide
<p><i>The trainer leads the trainees in reviewing the module)</i></p> <p>Summarize the main points of the training and together with the trainees review the main points:</p> <ul style="list-style-type: none"> • Importance of Green gram as a food and nutrition security crop • Green gram nutritional value and its importance in human health • Constraints in value addition and consumption of Green gram, and suggested solutions (at household level, community / farmers group level, industrial level) • Possible Green gram-based value added products <p>Discuss with trainees about new things learned from this module. What are some of the problems and issues that they have become more aware of in the module? List the take home messages the trainee may identify.</p>	<ul style="list-style-type: none"> • The last participants’ handouts • Module evaluation forms • Summary of the main points from the module on a flip chart and display • Take home messages

10.8 Participants’ Handouts

- Green gram Manual
- Green gram facts sheets on value addition

MODULE 11

MECHANIZATION OF GREEN GRAM PRODUCTION ACTIVITIES

11.1 Introduction to the module

Agricultural mechanization supports production, productivity and profitability in agriculture by achieving timeliness in farm operations. It comes along with precision in metering and placement of inputs, reducing available input losses, increasing utilization efficiency of costly inputs (seed, chemical, fertilizer, irrigation, water etc.), reducing unit cost of produce, enhancing profitability and competitiveness in the cost of operations. It also helps in the conservation of agricultural produce and byproducts from qualitative and quantitative damages; enables value addition and establishment of agro processing enterprises for additional income and employment generation. Agricultural mechanization is one of the important inputs that has potential to revolutionize all round development in the rural Kenya.

11.2 Module Learning outcomes

By the end of the module, the following outcomes should be achieved:

1. Climate smart tillage operations explained and appreciated
2. Knowledge of calibration of fertilizer and seed rates for planters enhanced and applied
3. Use of pest control implements and tools explained and demonstrated
4. Knowledge on harvest timing and yield estimation enhanced
5. Estimation of harvesting losses explained and understood
6. Machine and procedure for green grading explained demonstrated.

11.3 Module Target Group and Categories

This module is intended for service providers and county public extension agents.

11.4 Module Users

This module is intended for use by master trainers who are members of the Core Team of Trainers (CTT). The trainers using this module should thoroughly familiarize themselves with the participant's handouts.

11.5 Module Duration

The module is estimated to take 7 hours

11.6 Module Summary

Module 11: Mechanization of Green gram production activities			
Sessions	Training methods	Training materials	Duration
11.6.1 Introduction, objectives and expectations	<ul style="list-style-type: none"> • Personal introduction/ know your audience • Presentations • Plenary discussions 	<ul style="list-style-type: none"> • Flips charts • Projector • Laptop 	30 minutes
11.6.2 Climate smart tillage options	<ul style="list-style-type: none"> • Presentations • Plenary discussions 	<ul style="list-style-type: none"> • Flip chart • Projector • Laptop • Participants' handouts 	1 hour
11.6.3 Calibration of fertilizer and seed rates for planters	<ul style="list-style-type: none"> • Presentations • Plenary discussions 	<ul style="list-style-type: none"> • Flip chart • Projector • Laptop • Participants' handouts • Practical 	1 hour
11.6.4 Weed control equipment and tools, usage	<ul style="list-style-type: none"> • Presentations • Plenary discussions 	<ul style="list-style-type: none"> • Flip chart • Projector • Laptop • Participants' handouts • Practical 	1 hour
11.6.5 Harvest timing, yield estimation machines and tools	<ul style="list-style-type: none"> • Presentations • Plenary discussions 	<ul style="list-style-type: none"> • Flip chart • Projector • Laptop • Participants' handouts • Practical 	1 hour
11.6.6 Estimation of harvesting losses	<ul style="list-style-type: none"> • Presentations • Plenary discussions • Demonstrations 	<ul style="list-style-type: none"> • Flip chart • Projector • Laptop • Participants' handouts • Practical 	1 hour

11.6.7 Machine and procedure for green gram grading	<ul style="list-style-type: none"> • Presentations • Plenary discussions • Demonstrations 	<ul style="list-style-type: none"> • Flip chart • Projector • Laptop • Participants' Handouts • Practical 	1 hour
11.6.8 Model review	<ul style="list-style-type: none"> • Presentations • Plenary Discussions 	<ul style="list-style-type: none"> • Flip Charts • Hand outs 	30 minutes
Total			7 hours

11.7 Trainer's Guidelines

Module 11: Mechanization of green gram production activities	
11.7.1 Introduction, objectives and expectations (30 minutes)	Session Guide
<p><i>(The trainer welcomes trainees to the module on Mechanization of Green gram production activities. They are then invited to introduce themselves and state their expectations).</i></p> <p>Module Objectives</p> <p><i>(The trainer presents modules objectives).</i></p> <p>By the end of the module the trainee should be able to:</p> <ul style="list-style-type: none"> • Appreciate and explain various climate smart tillage operations • Calibrate fertilizer and seed rate for planters • Demonstrate weed control equipment and tools, usage • Demonstrate harvest timing, yield estimation, machines and tools • Estimate Pre-harvest and harvesting losses • Demonstrate machine and procedure for Green gram grading <p>In each case stating approximate prices and availability of machines.</p>	<p>Session Guide</p> <ul style="list-style-type: none"> • Summarize trainees' "expectations" and display. • Powerpoint presentation • Distribute participants' handouts on module objectives and training program

11.7.2 Green gram climate smart land preparation tools (1 hour)	Session Guide
<p><i>(The trainer presents on climate smart land preparation tools).</i></p> <p>Plenary Presentation (45 minutes)</p> <ul style="list-style-type: none"> • Overview of the Green gram mechanization activities • Climate smart tillage options. <p>Discussion (15 minutes)</p> <p>Let the trainees recall what they learned and discuss any issues that may arise.</p>	<ul style="list-style-type: none"> • PowerPoint presentation • Distribute participants' handouts • Brochures, leaflets and manual • All trainees
11.7.3 Green gram calibration of fertilizer and seed rate for planters (1 hour)	Session Guide
<p>Plenary Presentation (45 minutes)</p> <p>PowerPoint presentation highlighting on:</p> <ul style="list-style-type: none"> • Techniques and methods of planter seed and fertilizer rate determination. <p>Discussion (15 minutes)</p> <p>Let the trainees recall what they learned and discuss any issues that may arise.</p>	<ul style="list-style-type: none"> • PowerPoint presentation • Distribute participants' handouts • Brochures, leaflets and manual
11.7.4 Green gram chemical implements and tools operations (1 hour)	Session Guide
<p>Plenary Presentation (45 minutes)</p> <p>PowerPoint presentation highlighting on:</p> <ul style="list-style-type: none"> • Techniques and methods of using green gram pest control equipment. <p>Discussion (15 minutes)</p> <p>Let the trainees recall what they learned and discuss any issues that may arise.</p>	<ul style="list-style-type: none"> • PowerPoint presentation • Distribute participants' handouts • Brochures, leaflets and manual

11.7.5. Green gram harvest timing and yield estimation (1 hour)	Session Guide
Plenary Presentation (45 Minutes) PowerPoint presentation highlighting on: <ul style="list-style-type: none"> • Harvest timing and estimation of yield Discussion (15 Minutes) Let the trainees recall what they learned and discuss any issue that may arise.	<ul style="list-style-type: none"> • PowerPoint presentation • Distribute participants' handouts Brochures, leaflets and manual
11.7.6. Green gram harvesting machine operating principles (1 hour)	Session Guide
Plenary Presentation (45 minutes) PowerPoint presentation highlighting on: <ul style="list-style-type: none"> • Machine harvest losses Discussion (15 Minutes) Let the trainees recall what they learned and discuss any issues that may arise.	<ul style="list-style-type: none"> • PowerPoint presentation • Distribute participants' handouts Brochures, leaflets and manual
11.7.7 Machine and procedure for green gram grading (1 hour)	Session Guide
Plenary Presentation (15 Minutes) PowerPoint presentation highlighting: <ul style="list-style-type: none"> • Overview of green gram grading procedure Practical exercise (45 Minutes) Demonstrations on management options.	<ul style="list-style-type: none"> • PowerPoint presentation • Distribute participants' handouts • Brochures, leaflets and manual

11.7.8 Module review (30 hour)	Session Guide
<p><i>(The trainer leads trainees in reviewing the module).</i></p> <p>Summarize the main points of the training and together with the trainees review the main points:</p> <ul style="list-style-type: none"> • Various climate smart tillage operations • Calibration of fertilizer and seed rate for planters • Chemical implements and tools operations • Optimal crop Green gram harvesting stage and yield estimation • Estimation of harvesting losses of a machine • Harvesting machine operating principles • Machine and procedure for Green gram grading. <p>Discuss with trainees about new things learnt from this Module. What are some of the problems and issues that they have become more aware of in the module?</p>	<ul style="list-style-type: none"> • The last Participants” Handouts • Summary of the main points on from the module on a flip chart and display

11.8 Participants” Handouts

- Mechanization fact sheets
- Green gram production manual

MODULE 12

GREEN GRAM BUSINESS AND MARKETING

12.1 Introduction to the Module

This module introduces service providers and lead farmer trainers to the importance of Green gram farming as a business. The module also focuses on helping farmers acquire sustainable business skills that will assist them to build a long-term financial resilience to the impact of increasing drought through production and development of marketable Green gram products that contributes to addressing improved food and nutritional security and better income at the household level. This is consistent with Kenya government strategy for revitalizing agriculture and the current government policy whose aim is to make the agriculture sector profitable, commercially oriented, and competitive. The area covered under this module includes the importance of Green gram farming as a business, opportunities of Green gram products in local and international markets, market analysis and importance of a SWOT analysis, farm decision analysis tools (partial budget, break-even and gross-margin) and business plan.

12.2 Module Learning Outcomes

By the end of the module training, the following outcomes should be achieved:

1. The importance of Green gram farming as a business appreciated
2. The opportunities for Green gram products in local and international markets explained and understood
3. Knowledge on market analysis based on market standard requirements, consumer demands and preferences and market actors imparted and applied
4. The SWOT analysis matrix for a Green gram business described and appreciated
5. Knowledge on the principles and partial budget analysis (in alternatives), break-even analysis and gross margin analysis for an agricultural decision maker in Green gram business imparted and applied
6. The elements and the principles of preparing and implementing a profitable Business plan explained and understood
7. The principles of marketing 5 ‘Ps’ of Green gram production based on products, promotion, place and price and delivery systems explained and understood.

12.3 Module Target Group

This module is intended for service providers and public extension agents in the Green gram producing counties.

12.4 Module Users

This module is intended for use by master trainers who are members of the Core Team of Trainers (CTT). The trainers using this module should thoroughly familiarize themselves with the required participant's handouts.

12.5 Module Duration

The module is estimated to take 7 hours and 30 Minutes

12.6 Module Summary

Module 12: Green gram farming as a Business			
Sessions	Training methods	Training materials	Time
12.6.1 Introduction, objectives and expectations	<ul style="list-style-type: none"> ▪ Personal introductions ▪ Group discussions ▪ Plenary discussions ▪ Plenary Presentation 	<ul style="list-style-type: none"> ▪ Flips charts ▪ Felt pens ▪ Projector ▪ Laptop 	1 hour
12.6.2 Green gram production as a business	<ul style="list-style-type: none"> ▪ Plenary Presentation ▪ Plenary discussions 	<ul style="list-style-type: none"> ▪ Flips charts ▪ Felt pens ▪ Projector ▪ Laptop ▪ Participants' handouts 	1 hour
12.6.3 Opportunities for green gram products in local and international markets	<ul style="list-style-type: none"> ▪ Presentations ▪ Plenary discussions ▪ Demonstrations 	<ul style="list-style-type: none"> ▪ Flips charts ▪ Felt pens ▪ Projector ▪ Laptop ▪ Participants' handouts 	1 hour
12.6.4 Market analyses and marketing of Green gram farming products	<ul style="list-style-type: none"> ▪ Plenary Presentation ▪ Plenary discussions 	<ul style="list-style-type: none"> ▪ Flips charts ▪ Felt pens ▪ Projector ▪ Laptop ▪ Participants' handouts 	1 hour

12.6.5 Green gram Business Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis	<ul style="list-style-type: none"> ▪ Plenary Presentation ▪ Group exercise ▪ Plenary discussions 	<ul style="list-style-type: none"> ▪ Flips charts ▪ Felt pens ▪ Projector ▪ Laptops ▪ Participants' handouts 	1 hour
12.6.6 Green gram business management through: Partial budget, Break-even, and Gross margin analysis and Business planning	<ul style="list-style-type: none"> ▪ Presentations ▪ Group exercise ▪ Plenary discussions 	<ul style="list-style-type: none"> ▪ Flips charts ▪ Felt pens ▪ Projector ▪ Laptop ▪ Participants' handouts 	2 hours
12.6.7. Module Review	Plenary discussion	<ul style="list-style-type: none"> ▪ Flip charts ▪ Felt pens 	30 minutes
Total			7 hours 30 minutes

12.7 Trainer's Guidelines

Module 12:Green gram Farming as a Business	
12.7.1 Introduction and Expectations (1 hour)	Session Guide
<p><i>(The trainer welcomes trainees to the module on green gram farming as a business and the importance of commercially oriented green gram production for enhancing employment opportunities, better incomes and livelihoods. They are then invited to introduce themselves and state their expectations).</i></p> <p>Module Objectives</p> <p>(The trainer presents modules objectives)</p> <p>By the end of this module training the trainee should be able to:</p> <ul style="list-style-type: none"> • Appreciate the importance of green gram farming as a business • Understand the opportunities for green gram products in local and international markets • Conduct market analysis based on market standard requirements, consumer demands and preferences and market actors • Know what the SWOT matrix mean for a green gram business and describe a business by its strengths, weaknesses, opportunities and threats • Know the principles of partial budget analysis (in alternatives), break-even analysis and gross margin analysis for an agricultural decision making in Green gram business • Prepare and implement a profitable business plan • Know the marketing mix principles: 5 'P's' of green gram production based on Product, Price, Promotion, Place/Distribution and collective marketing and delivery systems. 	<ul style="list-style-type: none"> • Summarize trainees' "expectations" and display. • PowerPoint presentation • Distribute participants' handouts on module objectives and training program

12.7.2 Green gram farming as a business (1 hour)	Session guide
<p>Plenary Presentation (45 minutes)</p> <ul style="list-style-type: none"> • Concept of a business • Business opportunities and constraints along the components of Green gram value chain • Commercialization and competitiveness of Green gram as a commodity crop • Factors considered in Green gram farming as a commercial commodity crop • Advantages of practicing Green gram farming as a profitable agro-enterprise • Green gram business risk management through crop insurance • Crop production guidelines 	<ul style="list-style-type: none"> • PowerPoint presentation • Distribute participants' handouts • Group exercise
<p>Plenary Discussion (15 minutes)</p> <ul style="list-style-type: none"> • Discussion on the concept of farming as a family business and the opportunities 	
12.7.3 Opportunities for green gram products in local and international markets (1 hour)	Session Guide
<p>Plenary Presentation (45 minutes)</p> <ul style="list-style-type: none"> • Green gram business environment locally and internationally • Green gram production, demand and supply trends • Green gram quality requirement and their respective prices • Diverse marketable Green gram-based products (whole grain, dehulled, flour-based) • Market requirement for the Green gram-based products • How to conduct market survey for Green gram products <p>Plenary Discussion (15 minutes)</p> <ul style="list-style-type: none"> • Let the trainees recall what they learned and discuss any issue that may arise • Discussion on Green gram products available locally and unexploited market opportunities 	<ul style="list-style-type: none"> • PowerPoint presentation • Distribute participants' handouts

12.7.4 Market analyses and marketing of green gram farming products (1 hour)	Session Guide
<p>Plenary Presentation (45 Minutes).</p> <ul style="list-style-type: none"> • Green gram specific markets, target markets, market trends and seasonal variation • Green gram market segments in Kenya based on market demand and consumer preferences • Roles of wholesalers, retailers, exporters and brokers in green gram business • Entrepreneurship in green gram business • Importance of product packaging and branding, advertising, promotion and pricing • Marketing mix which includes 5“Ps”: product delivery system, sales of green gram products, product packaging and branding, advertising, promotion and pricing • Use of warehouse receipting for marketing green gram product • Access to access local and export markets including COMESA (formation of producer organizations, E-market platforms for green gram, national grain reserve etc.) • Contract farming in green gram business 	<ul style="list-style-type: none"> • PowerPoint presentation • Distribute participants' handouts • Group discussion
<p>Plenary Discussion (15 minutes)</p> <p>Discussion on green gram market structure and marketing mix.</p>	
12.7.5 Green gram Business Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis (1 hour)	Session Guide
<p>Plenary Presentation (30 minutes)</p> <ul style="list-style-type: none"> • Know what SWOT analysis means for a business • Describe a green gram farming as a business by its strengths, weaknesses, opportunities and threats 	<ul style="list-style-type: none"> • PowerPoint presentation • Distribute participants' handouts
<p>Practical exercises (30 Minutes)</p> <p>Group exercise on SWOT analysis on green gram business <i>(The group then compares the list from the trainer and that developed during the group exercise).</i></p>	<ul style="list-style-type: none"> • Business Training Notes • SWOT Factsheet • Practical Exercise

12.7.6 Farm Business Budgeting and Planning (2 hours)	Session Guide
<p>Plenary Presentation (1 hour)</p> <ul style="list-style-type: none"> Common types of farm budgets Role and applicability of the farm budgets Farm business record keeping and uses in budgeting and business planning Steps in preparing farm budgets: Partial budget analysis (in farm changes or alternatives), break-even analysis and gross margin analysis Elements of a successful business plan (the target Green gram products and how the products will be realized) Principles and steps in preparing a competitive and profitable business plan Characteristics of a good business plan <p>Practical exercises (1 hour)</p> <ul style="list-style-type: none"> Develop a gross margin budget for a green gram farming as a business for 1 acre Develop components of a business plan for green gram farming. 	<ul style="list-style-type: none"> PowerPoint presentation Distribute participants’ handouts Business training notes Marketing basics factsheet Practical exercises
<p>12.7.7 Module review (30 minutes)</p> <p><i>(The trainer leads the trainees in reviewing the module).</i></p> <p><i>Summarize the main points of the training and together with the trainees review the main points:</i></p> <ul style="list-style-type: none"> Concept of green gram farming as a business. Possible green gram marketable value added products Planning a green gram farm business based on SWOT analysis Green gram farm business financial management based on farm budget Green gram business plan and characteristics of a business plan <p><i>(Each trainee lists the main points learnt during the training. Discuss with trainees new things learnt from this Module. What are some of the problems and issues that they have become more aware of in the module).</i></p>	<p>Session guide</p> <ul style="list-style-type: none"> Group discussions Q& A session Recap the main points Test understanding Participatory evaluation of the session

12.8 Participants” Handouts

- ASDSP-Green gram Manual
- Starting a Green Gram Business in Kenya
- Strengths, Weaknesses, Opportunities and Threats in Green gram Farming Business
- Guiding Transformation from Subsistence to Commercial Green gram Farming

References

- Luyayi, F. et al. (2014). Farmers training entrepreneurship manual. Published by the World Agroforestry centre. United Nations Avenue, Gigiri. ISBN: 978-92-9059-356-0. Website: www.worldagroforestry.org
- USAID/Zimbabwe (2012). Farming as a Family Business. Training Manual. A guide to higher profits through managing farming as a family business.

MODULE 13

GREEN GRAM CROSS-CUTTING ISSUES (AGRICULTURAL INNOVATION PLATFORMS, POLICY, GENDER MAINSTREAMING AND SOCIAL INCLUSION)

SUB-MODULE 13.1: Agricultural Innovation Platforms

13.1 Introduction to the Sub-Module

This sub module exposes the service providers and lead farmer trainers to an innovation systems based configuration of stakeholders called the Agricultural Innovation Platform (AIP). It is an organizational model for stimulating innovation and development and brings actors together in a way that pools together skills and knowledge used to address challenges and utilize opportunities. The actors include individuals, private and public sector organizations, policy makers and other value chain stakeholders and are brought together to seek a solution to a challenge hindering agricultural productivity within a value chain such as Green gram. The Agricultural Innovation Platform facilitates actors to interact, innovate, learn and change with time as they seek a solution to the common challenge or compelling agenda. In an innovation platform, information exchange takes place in an environment where every actor's contribution is valued and various benefits accrue to all in a win-win situation. The AIP has been proved to be a useful methodology for catalyzing uptake, up scaling and sustaining use of various technologies.

13.2 Module learning Outcomes

By the end of the module, the trainee will have achieved:

1. The attributes of an innovation platform described and understood
2. Stakeholders mobilization for initiation of an Agricultural Innovation Platform explained and demonstrated
3. The establishment, management and monitoring of Agricultural Innovation Platforms explained and demonstrated
4. The process building innovation capacity of the actors explained and understood.

13.3 Module Target Group and Categories

The target users are public county extension officers, private agricultural service providers, and lead farmers.

13.4 Module Users

This module is intended for use by master trainers who are members of the Core Team of Trainers (CTT). The trainer using this module should thoroughly familiarize themselves with the participants' handouts.

13.5 Module Duration

The Module is estimated to take 3 hours

13.6 Module Summary

Sub-Module 13.6 Agricultural Innovation Platforms (AIP)			
Sessions	Training methods	Training materials	Time
13.6.1 Introduction, objectives and expectations	<ul style="list-style-type: none"> ▪ Personal introductions ▪ Presentations ▪ Plenary discussions 	<ul style="list-style-type: none"> ▪ Flips charts ▪ Projector ▪ Laptop 	30 minutes
13.6.2 An overview of attributes of an Agricultural Innovation Platform (The characteristics of an innovation platform)	<ul style="list-style-type: none"> ▪ PowerPoint Presentations ▪ Plenary discussions 	<ul style="list-style-type: none"> ▪ Flip charts ▪ Projector ▪ Laptop ▪ Participants' Handouts 	1 hour
13.6. 3 Pre-formation stages —stakeholder mobilization and sensitization. -AIP Phases (Initiation, Establishment, Management and Sustenance)	<ul style="list-style-type: none"> ▪ PowerPoint presentations ▪ Plenary discussions ▪ Role plays 	<ul style="list-style-type: none"> ▪ Flips charts ▪ Projector ▪ Laptop ▪ Handouts ▪ Roles 	1 hour
13.6. 4 Module review	<ul style="list-style-type: none"> ▪ Discussions 	<ul style="list-style-type: none"> ▪ Flip Charts 	30 minutes
Total			3 hours

13.1.7 Trainer's Guidelines

Agricultural Innovation Platform (AIP)	
13.1.7.1. Introduction, levelling of expectations and objectives (30 Minutes)	Session Guide
<p>Introduction</p> <p><i>(The trainer welcomes trainees to the module on Agricultural Innovation Platforms. They are then invited to introduce themselves and state their expectations).</i></p> <p>Module Objectives</p> <p><i>(The trainer presents modules objectives and levels out expectations)</i></p> <p>By the end of the module the trainee should be able to:</p> <ul style="list-style-type: none"> • Explain characteristics of an innovation platform • Mobilize and sensitize stakeholders • Describe how to initiate and establish Agricultural Innovation Platforms • Explain how to manage and sustain innovation capacity of actors in Agricultural Innovation Platforms. 	<ul style="list-style-type: none"> • Summarize trainees' "expectations" and display. • PowerPoint presentation • Module objectives and training program
13.1.7.2. The characteristics of an innovation platform (1hour)	Session Guide
<p><i>(The trainer should present an overview of innovation platforms and their main characteristics).</i></p> <p>Plenary Presentation (30 minutes)</p> <ul style="list-style-type: none"> • Past progression of research and extension models and their shortcomings • Agricultural Innovation Systems perspective • and Agricultural Innovation Platforms model • Comparison of Agricultural Innovation Platforms with social and technical events working through committees with different roles but common goals • Value chain actor linkages and other benefits. <p>Discussion (30 minutes)</p> <p>Let the trainees recall what they learned and discuss any issue that may arise.</p>	<ul style="list-style-type: none"> • PowerPoint presentation • Notes handouts, • Brochures, information leaflets and manuals

13.1.7.3 Preformation and formation phases of the Green gram AIP (1 hour)	Session Guide
<p>Plenary Presentation (50 Minutes)</p> <p>Trainer presents on:</p> <p>Initiation or preformation phase</p> <ul style="list-style-type: none"> Engagement or mobilization of stakeholders in the sorghum value chain Visioning process and rules of engagement mediated by an initiator such as an change agent <p>Establishment</p> <ul style="list-style-type: none"> Assessment of the status of the value chain to clearly identify the compelling agenda or bottleneck - APVC analysis to identify weaknesses in the chains. Laying out of proper plans to define roles, establish task-based committees, expected milestones and resourcing strategies. <p>Management</p> <ul style="list-style-type: none"> Keeping stakeholders focused on the vision and upholding values to ensure an inclusive and transparent process. Neutral facilitation to ensure joint strategy building and action and the coordination of support activities. Managing emerging experts taking up leading roles and issues as champions. <p>Sustainability</p> <ul style="list-style-type: none"> Guiding in evolving and identifying fresh issues or challenges Maintaining capacity acquired to address new issues or challenges in subsequent cycles. <p>Discussion (10 minutes)</p> <p>Let the trainees recall what they learned and discuss any issues that may arise.</p>	<ul style="list-style-type: none"> Powerpoint presentation Distribute participants' handouts Brochures, leaflets, manuals Short video clips

13.1.7.4. Module review (30 minutes)	Session Guide
<p><i>(The trainer leads the trainees in reviewing the module).</i></p> <p>Summarize the main points of the training and together with the trainees review the main points on:</p> <ul style="list-style-type: none"> • AIP characteristics and initiation • AIP establishment and management • Sustenance of Green gram AIPs <p>Discuss with trainees' new things learnt from this module. What are some of the problems and issues that they have become more aware of in the module?</p>	<ul style="list-style-type: none"> • The last Participants” Handouts • Summarize the main points from the module on a flip chart and display

13.1.8 Participants” Handouts

- Agricultural Innovation Platform (AIP) fact sheets

References:

1. Kamau, G.M. and Makini F.W. (2019). Agricultural Innovation Platforms for knowledge exchange and learning for technical, economic, social and institutional change
2. Makini F., Mulinge W., Mose L., Salasya B., Kamau G., Makelo M., and On'gala, J. (2018). Impact of Agricultural Innovation Platforms on Smallholder livelihoods in Eastern and Western Kenya. FARA Research Results Vol 2 (6)
3. Makini , Kamau G., Makello M., Adekunle A., Mburathi G. (2013). Operational field guide for developing and managing local agricultural innovation platforms

SUB-MODULE 13.2: Green Gram Gender, Vulnerable and Marginalized Groups (VMGs), Socio, Environmental Concern and Cohesion

13.2.1 Introduction to the Sub-Module

Green gram is a major agro-enterprise and therefore all the gender categories (men, women, youth vulnerable marginalized groups (VMGs) are involved in its value chain from production through marketing to consumption. However, women perform most of the crop's production activities such as planting, weeding, harvesting and threshing while men mostly perform the task of marketing. Despite this huge women's contribution, gender inequalities exist in all areas of the value chains. Some of these gender inequalities include: unfair division of labour, allow access to and control of resources and decision making within and beyond the household. These inequalities limit women, youth and VMGs access to and benefits from the various Technologies Innovations and Management Practices (TIMPs) at different nodes of the value chain, at the macro-level, effective participation of women and youth in groups and market activities is constrained by their low decision making power, lack of voice and lack of access to financial resources. Gender analysis examines the productive and reproductive roles of men and women; access, control and ownership of resources; levels of power relations; differential needs, constraints and opportunities; and impact of these differences (positive/ negative) on lives of men, women, youth and the VMGs.

Green gram value chain TIMPs interventions, when designed and implemented with gender equitable principles, can foster adoption leading to increased productivity as well as enhanced social and environmental impacts. The overall objective of this module is to ensure that gender mainstreaming and social inclusion in Green gram TIMPs is enhanced by field agricultural practitioners and extension officers as an effort geared towards achieving Climate Smart Agriculture “triple win” in target counties.

13.2.2 Module learning outcomes

By the end of the training module, the following outcomes should be achieved:

1. The concept of Gender mainstreaming and social inclusion in Green gram value chain understood and appreciated
2. Youth empowerment in green gram value chain explained and understood
3. Women empowerment in green gram value chain explained and understood
4. Strategies for inclusion of vulnerable and marginalized groups in Green gram value chain understood and applied
5. Socio-cultural barriers in Green gram value chain explained and understood

- Knowledge on Environmental and social management framework (ESMF) tool enhanced.

13.2.3 Module Target Group

This module is intended for service providers and county public extension agents.

13.2.4 Module Users

This module is intended for use by master trainers who are members of the Core Team of Trainers (CTT). This module outlines the learning outcomes, the category of trainees targeted, module summary, and participants’ handouts. The trainer using this module should thoroughly familiarize themselves with the participant’s handouts.

13.2.5 Module Duration

The module is estimated to take 7 hours.

13.2.6 Module Summary

Module 13.2: Gender mainstreaming and social inclusions in the green gram value chain			
Sessions	Training methods	Training materials	Duration
13.2.6.1 Introduction, expectations and objectives	<ul style="list-style-type: none"> Personal introductions Presentations Plenary discussions 	<ul style="list-style-type: none"> Flips charts Felt pens Projector Laptop Participants’ handouts 	30 minutes
13.2.6.2 Gender mainstreaming in Green gram value chain	<ul style="list-style-type: none"> PowerPoint Presentations Group discussions Plenary discussions 	<ul style="list-style-type: none"> Flips charts Felt pens Projector Participants’ handouts 	1 hour
13.2.6.3 Youth empowerment in Green gram value chain	<ul style="list-style-type: none"> PowerPoint Presentations Group discussions Plenary discussions 	<ul style="list-style-type: none"> Flips charts Felt pens Projector Laptop Participants’ handouts 	1 hour

13.2.6.4 Women empowerment in Green gram value chain	<ul style="list-style-type: none"> ▪ PowerPoint Presentations ▪ Group discussions ▪ Plenary discussions 	<ul style="list-style-type: none"> ▪ Flips charts ▪ Felt pens ▪ Projector ▪ Laptop ▪ Participants' handouts 	1 hours
13.2.6.5 Strategies for inclusion of vulnerable and marginalized groups	<ul style="list-style-type: none"> ▪ PowerPoint Presentations ▪ Group discussions ▪ Plenary discussions 	<ul style="list-style-type: none"> ▪ Flips charts ▪ Felt pens ▪ Projector ▪ Laptop ▪ Participants' handouts 	1 hours
13.2.6.6 Environmental and Social Management Framework	<ul style="list-style-type: none"> ▪ PowerPoint Presentations ▪ Group discussions ▪ Plenary discussions 	<ul style="list-style-type: none"> ▪ Flips charts ▪ Felt pens ▪ Projector ▪ Laptop ▪ Participants' handouts 	1 hour
13.2.6.7 Socio economic and environmental impact of Green gram activities	<ul style="list-style-type: none"> ▪ PowerPoint presentations ▪ Group discussions ▪ Plenary discussions 	<ul style="list-style-type: none"> ▪ Flips charts ▪ Felt pens ▪ Projector ▪ Laptop ▪ Participants' handouts 	1 hour
13.2.6.8 Module Review	<ul style="list-style-type: none"> ▪ Plenary discussions 	<ul style="list-style-type: none"> ▪ Flips charts ▪ Felt pens 	30 Minutes
Total			7 hours

13.2.7 Trainer's Guidelines

Sub Module 13.2: Gender mainstreaming and social inclusion in Green gram value	
13.2.7.1 Introduction, Objectives and Expectations (30 Minutes)	Session Guide
<p><i>(The trainer welcomes trainees to the module on gender mainstreaming and social inclusion in Green gram value chain. They are then invited to introduce themselves and state their expectations)</i></p> <p>Module Objectives (30 Minutes)</p> <p>(The trainer presents modules objectives)</p> <p>By the end of the module training the trainee should be able to:-</p> <ul style="list-style-type: none"> • Appreciate gender main streaming and social inclusion , in Green gram value chain • Appreciate youth empowerment in Green gram value chain • Appreciate women empowerment in Green gram value chain • Know strategies for inclusion of vulnerable and marginalized groups in Green gram value chain • Know socio-cultural barriers in Green gram value chain • Realize the environmental and social management framework (ESMF) tool 	<ul style="list-style-type: none"> • Summarize Trainees' "Expectations" and display. • PowerPoint Presentation • Flipcharts • Group exercise • Objectives and Training Program

13.2.7.2 Gender mainstreaming and social inclusion in Green gram value chain (1 hour 30 Minutes)	Session Guide
<p><i>(The trainer should present and explain what is gender mainstreaming, who does what activity, who has access to what resources etc. and why gender mainstreaming is important in Green gram value chain).</i></p>	<ul style="list-style-type: none"> PowerPoint presentation, group exercise
<p>Plenary Presentation (30 minutes)</p>	<ul style="list-style-type: none"> Plenary discussions
<ul style="list-style-type: none"> Definition of gender What is gender mainstreaming and why it is important Who does what? (gender division of roles in Green gram value chain) Who owns what? (access and control of resources & benefits) Who makes which decisions? Socio-cultural limitations related to Green gram value chain Existing policies in support of gender mainstreaming. 	<ul style="list-style-type: none"> Distribute participants' handouts Group exercise Plenary discussions
<p>Group exercise and discussion (30 Minutes)</p> <p>Let the trainees recall what they learned and discuss any issues that may arise.</p>	
13.2.7.3 youth empowerment in Green gram value chain s (1hour)	Session Guide
<p>Plenary Presentation (30 minutes)</p> <ul style="list-style-type: none"> Why agriculture is not attractive to youth Youth's role in the value chain Strategies to empower youth in Green gram value chain. 	<ul style="list-style-type: none"> PowerPoint Presentation Group exercise Plenary discussion
<p>Group work and Discussion (30 Minute)</p> <p>Let the trainees recall what they learned and discuss any issues that may arise.</p>	

13.2.7.4 Women empowerment in green gram value chain (1 hour)	Session Guide
Plenary Presentation (45 minutes) PowerPoint presentation highlighting: <ul style="list-style-type: none"> • Women's role in the value chain • Challenges facing women in the value chain • Strategies for empowering women in the value chain. Plenary discussion (15 minutes) Let the trainees recall what they learned and discuss any issue that may arise	<ul style="list-style-type: none"> • PowerPoint Presentation • Distribute participants' handouts • Group exercise • Plenary discussion
13.2.7.5 Strategies for inclusion of vulnerable and marginalized groups in green gram value chain (1 Hour)	Session Guide
Plenary Presentation (30 hour) <ul style="list-style-type: none"> • Who are vulnerable and marginalized groups (VMGs) • Why gender inequality exists • Social inclusion and why • Strategies of inclusion of VMGs. Plenary Discussion (30 minutes) Let the trainees recall what they learned and discuss any issues that may arise.	<ul style="list-style-type: none"> • PowerPoint presentation • Group exercise • Plenary discussion
13.2.7.6 Environmental and social management framework (ESMF) (1 hour)	Session Guide
Plenary Presentation (45 minutes) <ul style="list-style-type: none"> • Objective of ESMF in green gram value chain • Impacts and action plans for safeguards • Environmental and socioeconomic impacts of green gram value chain activities. Plenary discussion (15 minutes) Let the trainees recall what they learned and discuss any issues that may arise.	<ul style="list-style-type: none"> • PowerPoint presentation • Plenary discussion

13.2.7.7 Module review (30 Minutes)	Session Guide
<p><i>The trainer leads the trainees in reviewing the module).</i></p> <p>Summarize the main points of the training and together with the trainees review the main points:</p> <ul style="list-style-type: none"> • What is gender mainstreaming and why it is important • Youth empowerment in Green gram value chain • Women empowerment in Green gram value chain • Strategies for inclusion of vulnerable and marginalized groups in Green gram value chain • Socio-cultural barriers in the value chain • Environmental and socioeconomic impacts of green gram activities <p>Let the trainees recall what they learned and discuss any issues that may arise.</p>	<ul style="list-style-type: none"> • Summary of the main points on from the module on a flip chart and display

13.2.8. Participants’ Handouts

- Gender mainstreaming and social inclusion fact sheets

Reference

- Commonwealth secretariat, (2001). Gender Mainstreaming in Agriculture and Rural Development: A Reference Manual for Governments and Other Stakeholders. Marlborough house, London.

SUB-MODULE 13.3

CLIMATE-SMART AGRICULTURAL POLICY OPTIONS

13.3.1 Introduction to the Sub-Module

Kenya adopted Vision 2030 in 2007 as a new blue print and roadmap for political, social and economic development of the country in the next two decades. The Vision also identifies agriculture as the engine of growth through transformation of smallholder and subsistence agriculture to innovatively and commercially oriented agriculture. Kenya promulgated the new constitution in 2010 which proposes two levels of governments (national & county) with defined functions. Agriculture is one of the devolved governance functions. However, agriculture in Kenya is facing many challenges and threats such as climate change, declining agricultural performance, limited high potential agricultural land and over-reliance on rain fed agriculture, limited diversification of Agricultural production, poor and inadequate rural infrastructure, inadequate and declining research in agriculture, agricultural sector financing and related activities and low technical capacity among the actors. Therefore, agricultural policy in Kenya revolves around the main goals of increasing productivity and income growth, especially for smallholders; enhanced food security and equity, emphasis on irrigation to introduce stability in agricultural output, commercialization and intensification of production especially among small scale farmers; appropriate and participatory policy formulation and environmental sustainability. This module introduces the national and county governments, service providers, lead farmers, trainers and relevant stakeholders in the design and implementation of effective climate-smart-sensitive agricultural policy options to promote the transition to climate-smart agriculture at the smallholder level. The policy context of this module is structured around six topics.

13.3.2 Module Learning Outcomes

By the end of this module training, the following outcomes should be achieved:

1. The role of agricultural policy frameworks in Kenya discussed and appreciated
2. Climate-smart agriculture practices, policy options and approaches identified and understood
3. Climate-smart-sensitive policy cycle explained and understood
4. Implementation of the climate-smart-sensitive policy at the county level discussed and shared
5. Financing and Investments for Climate-smart Agriculture discussed and appreciated
6. The need for a Technology Policy explained and understood

13.3.3 Module Target Group

This module is intended for service providers, policy makers, public extension agents

and relevant stakeholders in the design and implementation of effective, climate-smart-sensitive agricultural policies.

13.3.4 Module Users

This module is intended for use by master trainers who are members of the Core Team of Trainers (CTT). The trainers using this module should thoroughly familiarize themselves with the required participants' handouts.

13.3.5 Module Duration

The module is estimated to take 5 hours 30 minutes.

13.3.6 Module Summary

Module 13.3: Climate-Smart Agricultural Policy Options			
Sessions	Training methods	Training materials	Time
13.3.6.1 Introduction, learning expectations and outcomes	<ul style="list-style-type: none"> ▪ Personal introductions ▪ Group discussions ▪ Plenary discussions ▪ Presentations 	<ul style="list-style-type: none"> ▪ Flips charts ▪ Felt pens ▪ Projector ▪ Laptop 	30 minutes
13.3.6.2 Agricultural Policy Frameworks in Kenya	<ul style="list-style-type: none"> ▪ Presentations ▪ Practical exercises ▪ Plenary discussions 	<ul style="list-style-type: none"> ▪ Flips charts ▪ Felt pens ▪ Projector ▪ Laptop 	1 hour
13.3.6.3 Climate-smart agriculture practices, policy options and approaches	<ul style="list-style-type: none"> ▪ Presentations ▪ Practical exercises ▪ Plenary discussions 	<ul style="list-style-type: none"> ▪ Flips charts ▪ Felt pens ▪ Projector ▪ Laptop ▪ Participants' handouts 	1 hour
13.3.6.4 Climate-smart-sensitive policy cycle	<ul style="list-style-type: none"> ▪ Presentations ▪ Plenary discussions 	<ul style="list-style-type: none"> ▪ Flips charts ▪ Felt pens ▪ Projector ▪ Laptop ▪ Participants' handouts 	20 minutes

13.3.6.5 Implementation of the climate-smart-sensitive policy at the county level	<ul style="list-style-type: none"> ▪ Presentations ▪ Practical exercise ▪ Plenary discussions 	<ul style="list-style-type: none"> ▪ Flips charts ▪ Felt pens ▪ Projector ▪ Laptop ▪ Participants' handouts 	50 minutes
13.3.6.6 Financing and Investments for Climate-smart Agriculture	<ul style="list-style-type: none"> ▪ Presentations ▪ Practical exercise ▪ Plenary discussions 	<ul style="list-style-type: none"> ▪ Flips charts ▪ Felt pens ▪ Projector ▪ Laptop ▪ Participants' handouts 	1 hour
13.3.6.7 Technology Policy	<ul style="list-style-type: none"> ▪ Presentations ▪ Plenary discussions 	<ul style="list-style-type: none"> ▪ Flips charts ▪ Felt pens ▪ PowerPoint Presentations ▪ Participants' handouts 	20 minutes
13.3.6.8 Module Review	Plenary discussion	Flip charts Felt pens	30 minutes
Total			5 hours 30 minutes

13.3.7 Trainer's Guidelines

Module 13.3: Climate-Smart Agricultural Policy Options	
13.3.7.1 Introduction, Expectations and Outcomes (30 Minutes)	Session Guide
<i>(The trainer welcomes trainees to the module. They are then invited to introduce themselves and state their expectations).</i>	<ul style="list-style-type: none"> • Summarize trainees' "expectations" and display. • Powerpoint presentation • Distribute participants' handouts on module objectives and training program
Trainees Expectations <i>(The trainer requests the trainees to form groups and list their expectations).</i>	
Module Objectives <i>(The trainer presents module learning objectives)</i> By the end of this module, the trainees' should be able to: <ul style="list-style-type: none"> • Appreciate the role of agricultural policy frameworks in Kenya • Understand climate-smart agriculture practices, options and approaches • Understand the stages in climate-smart-sensitive policy cycle • Understand the phases in the implementation of the climate-smart-sensitive policy at the county level • To evaluate and select financing and investments options for Climate-smart Agriculture • To understand the need of a technology policy. 	
13.3.7.2 Agricultural Policy Frameworks in Kenya (1 hour)	
Plenary Presentation (30 minutes) <ul style="list-style-type: none"> • The role of agricultural policy frameworks in Kenya Practical Exercise (30 minutes) <i>(The trainer requests the trainees to form groups and identify the gaps between agricultural policy frameworks and the existing agricultural policies).</i>	<ul style="list-style-type: none"> • PowerPoint presentation • Distribute participants' handouts • Group exercise

13.3.7.3 Climate-smart agriculture practices, policy options and approaches (1 hour)	Session guide
<p>Plenary Presentation (30 minutes)</p> <p>Presentation highlighting:</p> <ul style="list-style-type: none"> • Considerations for climate-smart production systems • Existing systems, practices and methods suitable for climate-smart agriculture • Institutional and policy options • Ensuring farmer organizations for market access • Gendered approach. <p>Practical Exercise and plenary Discussions (30 minutes)</p> <p><i>(The trainer requests the trainees to form groups and identify the existing climate-smart agriculture practices and the relevant policy options for implementation).</i></p>	<ul style="list-style-type: none"> • PowerPoint presentation • Distribute participants’ handouts • Group exercise
13.3.7.4 Climate-smart-sensitive policy cycle (20 minutes)	Session Guide
<p>Plenary Presentation (10 minutes)</p> <ul style="list-style-type: none"> • Stages in the climate-smart-sensitive policy cycle <p>Plenary Discussions (10 minutes)</p>	<ul style="list-style-type: none"> • PowerPoint presentation • Distribute participants’ handouts
13.3.7.5 Implementation of the climate-smart-sensitive policy at the county level (50 Minutes)	Session Guide
<p>Plenary Presentation (20 minutes)</p> <ul style="list-style-type: none"> • Phases in the implementation of the climate-smart-sensitive policy at the county level. <p>Practical exercise (30 minutes)</p> <p><i>(The trainer requests the trainees to form groups and develop a program showing steps, activities and stakeholders for the implementation of climate-smart policies).</i></p>	<ul style="list-style-type: none"> • PowerPoint presentation • Distribute participants’ handouts • Practical Exercise

13.3.7.6 Policy financing and investments for Climate-smart Agriculture (1 hour)	Session Guide
<p>Plenary Presentation (30 minutes)</p> <ul style="list-style-type: none"> • Why financing is needed • Financing gaps • Sources of financing • Financing mechanisms • Connecting action to financing • Types of subsidies to farmers 	<ul style="list-style-type: none"> • PowerPoint presentation • Distribute participants’ handouts • Practical exercise
<p>Group exercises (30 minutes)</p> <p><i>(The trainer requests the trainees to form groups and identify potential sources of financing, financing mechanisms and connecting action to financing).</i></p>	
13.3.7.7 Need of Technology Policy (20 minutes)	Session guide
<p>Plenary Presentation (10 minutes)</p> <ul style="list-style-type: none"> • What is a technology policy? • Why do we need technology policy? • Is technology policy inconsistent with a market oriented economy? • Technology policy in Kenya 	<ul style="list-style-type: none"> • PowerPoint presentation • Distribute participants’ handouts
13.3.7.8 Module review (30 minutes)	Session guide
<p><i>(The trainer leads the trainees in reviewing the module).</i></p> <ul style="list-style-type: none"> • Summarize the main points of the training and together with the trainees review the main points. • Participants’ lists the main points learnt during the training • Discuss with trainees’ new things learnt from this module. <p>Ask the trainees what are some of the problems and issues that they have become more aware of in the module.</p>	<ul style="list-style-type: none"> • Q& A session • Recap the main points • Test understanding • Participatory evaluation of the session

13.3.8 Participants’ Handouts

- Hand out on Agricultural Policies in Kenya
- Green gram production manual

13.9 References

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Ha-Joon Chang (2002). African Technology Policy Studies Network (ATPS). Who needs Technology Policy? Published by The African Technology Policy Studies Network, Nairobi, Kenya. ISBN: 9966-916-18-0

RoK (2007). Kenya adopted Vision 2030.

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ANNEX 1: TRAINING PROGRAM

TIME	ACTIVITY	DURATION
Day 0	Arrival day	
Late Evening	<ul style="list-style-type: none"> Arrival of participants and registration – Host Setting up and prepare training venue and materials 	
Day 1		
8.00am-10.00am	Session 1: Introduction, objectives & expectations <ul style="list-style-type: none"> Welcome and Introductions – (All) Overview of KCSAP Project Workshop Objectives and Program 	2 hours
10.00am-10.30am	Tea/Coffee Break	30 minutes
10.30am-11.30am	Module 1. Climate Change and Agriculture <ul style="list-style-type: none"> Introduction to climate change and variability Projected future climate change scenarios, mitigation and adaptation strategies 	1 hour
11.30-1.00pm	Module 2: Farmer Field and Business School approach in green grams <ul style="list-style-type: none"> Introduction and leveling of expectations Introduction to FFBS Designing an FFBS program Key activities in FFBS 	1 hour 30 min
1.00pm-2.00pm	Lunch Break	1 hour
2.00pm -3.00pm	Module 3: Green gram production niches and climatic requirements <ul style="list-style-type: none"> Importance of green grams in Kenyan Green gram production and ecological requirements / climatic requirements, average yields and constraints in target counties Green gram production and ecological / climatic requirements Constraints in green gram production in counties 	1 hour

TIME	ACTIVITY	DURATION
3.00pm – 3.30 pm	<ul style="list-style-type: none"> • Introduction to communication and facilitation skills • Module review 	30 minutes
3.30pm – 5.00 pm	Module 6: Green gram climate smart Agronomic practices Agronomic practices for green gram production	1 hour 30 minutes
5.00pm-5.30pm	Tea/Coffee Break	30 minutes
Day 2:		Duration
8.00 – 8.30 am	Recap for day 1	30 minutes
8.30 - 10.00 am	Module 8a: Crop Health <ul style="list-style-type: none"> • Pests of green grams • Pest identification scouting and threshold determination 	1 hour 30 minutes
10.00am - 10.30 am	Tea/Coffee Break	30 minutes
10.30 am - 11.30 am	<ul style="list-style-type: none"> • Management of pests that cause economic losses and their management 	1 hour
11.30am - 1.00 pm	<ul style="list-style-type: none"> • Management of pests that cause economic losses and their management • Sustainable integrated green gram pest management 	1 hour 30 minutes
1.00pm-2.00pm	Lunch Break	
2.00 pm -3.00 pm	Module 8b: Crop Health <ul style="list-style-type: none"> • Green gram diseases identification and threshold determination 	1 hour
3.00pm - 4.00pm	<ul style="list-style-type: none"> • Sustainable integrated green gram disease management 	1 hour
4.00pm - 5.00pm	<ul style="list-style-type: none"> • Scope and safe use of pesticides, updated list and registered pesticides and implications • <i>Calibration of Knapsack sprayers</i> 	1 hour
5.00pm - 5.30pm	Tea/Coffee Break	30 minutes
Day 3		
8.00am-8.30am	<ul style="list-style-type: none"> • Recap for day 2 	
8.30am – 10.00am	Module 9: Green gram post-harvest losses and the economic importance management <ul style="list-style-type: none"> • Green gram harvesting, post-harvest and economic losses 	1 hour 30 min
10.00am-10.30am	Tea/Coffee Break	1 hour

TIME	ACTIVITY	DURATION
10.30am - 1.00pm	<ul style="list-style-type: none"> • Constraints in post-harvest handling of green grams and options to reduce losses 	1 hour
1.00pm – 2.00pm	Lunch Break	
2.00pm -3.00 pm	Module 5. Green gram seed systems <ul style="list-style-type: none"> • Definition of seed and types of seed systems in Kenya • Formal seed systems and their characteristics 	1 hour 30 minutes
3.00pm – 5.00pm	<ul style="list-style-type: none"> • Informal seed systems and their characteristics • Production of Quality declared seed and implications on seed certification 	1 hour 30 minutes
4.30pm – 5.00pm	Tea/coffee Break	30 minutes
Day 4		
8.00am - 8.30 am	Recap for day 3	30 mins
8.30 am – 10.00am	Module 7: Integrated soil and water management practices for green gram production <ul style="list-style-type: none"> • Soil composition properties and health 	1 hour 30 minutes
10.00 am -10.30 am	Tea/Coffee Break	30 mins
10.30am – 12.00	<ul style="list-style-type: none"> • Soil and plant tissues sampling and analysis • Soil fertility and plant nutrition • Soil health and ISFM climate resilient cropping systems 	1 hour 30 minutes
12.00-1.00pm	<ul style="list-style-type: none"> • Soil water management and water harvesting technologies • Soil degradation, problem soils and their reclamation and management • Soil sampling procedures 	1 hour
1.00pm 2.00 pm	Lunch Break	1 hour
2.00pm – 4.00 pm	Module 4: Green gram variety selection <ul style="list-style-type: none"> • Green gram varieties and their characteristics 	2 hours
4.00pm – 5.00pm	<ul style="list-style-type: none"> • Green gram plant spacing and optimal plant density/seeding rates 	2 hours
5.00 pm – 5.30pm	Tea/coffee Break	30 minutes
Day 5		
8.00 am – 8.30 am	Recap for day 4	

TIME	ACTIVITY	DURATION
8.30am – 9.30am	Module 10: Green gram Value addition <ul style="list-style-type: none"> Role of green gram as food and nutrition security crop 	1 hour 30 minutes
9.30am-10.00 am	Tea/coffee Break	30 minutes
10.00am-12.00	<ul style="list-style-type: none"> Green gram nutritional composition and its role in human nutrition 	2 hour
12.00-1.00pm	<ul style="list-style-type: none"> Introduction to Innovation platforms 	1 hour
1.00pm -2.00pm	Lunch Break	1 hour
2.00- 3.00pm	<ul style="list-style-type: none"> Establishment of innovation platforms, their management od sustainability 	1 hour
3.00pm – 4.00pm	Module 12. Green gram Business and Marketing <ul style="list-style-type: none"> Green gram production as a business Market analysis and marketing opportunities of green gram and its products 	1 hour
4.00pm -5.00 pm	<ul style="list-style-type: none"> Tea/ Coffee Break 	30 Minutes
Day 6		
8.00 am – 8.30 am	Recap for day 5	
8.30 – 10.00am	<ul style="list-style-type: none"> Recap Agricultural policy framework in Kenya Climate smart agricultural practices, policy options, and approaches at national and county level 	1 hour 30 mins
10.00 am -10.30 am	<ul style="list-style-type: none"> Tea/Coffee Break 	
10.30 am – 1.00pm	<ul style="list-style-type: none"> Module 11. Green gram Mechanization Activities Climate smart tillage options Harvest timing yield estimation machines and tools 	2 hour 30 mins
1.00-2.00pm	<ul style="list-style-type: none"> Calibration of fertilizer and seed rate equipment Weed control equipment and tools 	
2.00 - 4.30pm	<ul style="list-style-type: none"> Practical 	2 hours 30 mins
4.30pm-5.00pm	Tea/Coffee Break	30 minutes
Day 7		
8.00am–8.30am	<ul style="list-style-type: none"> Prayers and recap for day 6 	

TIME	ACTIVITY	DURATION
8.30 – 10.00am	13.2: Gender mainstreaming and social inclusion <ul style="list-style-type: none"> • Prayers and recap of previous day • Gender and its mainstreaming in agriculture 	2 hour 30 minutes
1.00am -10.30am	Tea Brea Break	30 minutes
10.30am -1.00pm	<ul style="list-style-type: none"> • Gender mainstreaming in green gram gram production and marketing 	2 hour 30 minutes
1.00pm - 2.00pm	Lunch Break	
2.00pm-3.00pm	<ul style="list-style-type: none"> • Youth and Women Empowerment in green gram value chain 	1 hour 30 minutes
3.00-5.00pm	<ul style="list-style-type: none"> • Strategies for inclusion of vulnerable marginalized groups 	
Day 7		
8.00am–8.30am	<ul style="list-style-type: none"> • Farm/Field visit (the day teas and lunch service to be arranged with the cafeteria) 	Whole day
5.00 -5.30 pm	<ul style="list-style-type: none"> • Tea/coffee break 	
Day 8		
8.00am–8.30am	<ul style="list-style-type: none"> • Prayers and recap for day 7 	
8.30amm – 10.00 am	<ul style="list-style-type: none"> • Plenary presentation of County Green gram Work plans (Taita Taveta) 	1 hour
10.30am-11. 00 am	Tea/coffee Break	30 minutes
10.00am -1.00 noon	<ul style="list-style-type: none"> • Plenary presentation of County Green gram Work plans (West Pokot) 	2 hours
1.00pm -2.00 pm	Lunch Break	
2.00pm -4.00 pm	<ul style="list-style-type: none"> • Award of certificates and Closing Ceremony - Dr. Felister W. Makini (Deputy Director General – Crops) and Dr. Charles Lunga'ho - NPCU and Ms. Violet Kirigua (KALRO KCSAP Crops coordinator) 	1 hour
4.00pm -5.00 pm	<ul style="list-style-type: none"> • Tea/coffee break 	
Day 9		
	<ul style="list-style-type: none"> • DEPARTURE 	

ANNEX 2: GENERAL REFERENCE MATERIALS

Category / Modules	Publication title	Reference types	No Pages	Farmer Category
				A= New entrant/Green gram Elite farmer B= Elite Green gram Farmer
General Green gram production	Green gram production Guide in Kenya	Manual	25	A/B
	A Manual for Mung bean (Green gram) Production in Uganda	Training Manual	26	A/B
Green gram Varietal Selection	Early maturing, large podded Green gram Variety (Biashara) for improved food security and income generation	Leaflet	2	A/B
	Early maturing, large podded Green gram Variety (Ndengu tosha) for improved food	Leaflet	2	A/B
	Early maturing, large podded Green gram Variety (Karembo) for improved food	Leaflet	2	A/B
	Variety Characteristics and Production Guidelines of Traditional Crops	Training Manual	38	A/B

Green gram Crop Health	Crop Management Guidelines Integrated Pest Management (Cost saving Techniques for Smallholder Farmers)	Manual	34	B/A
Green gram Business Management	Green gram Production Guide Characteristics Markets for Green gram in the East African Community by Kilimo Trust	Manual Booklet	30 89	B/A B
Gender Mainstreaming	Gender Mainstreaming in Agriculture and Rural Development: A Reference Manual for Governments and Other Stakeholders. Marlborough house, London.	Manual	100	B



Kenya Climate Smart Agriculture Project (KCSAP)
P.O. Box 57811, City Square, Nairobi, 00200, Kenya